

The Scholar

Issue 11
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thebrilliantclub.org

*Nature, Humanity
and Literature*

+

*Academic essays on
Malaria outbreaks and
post-war politics from
Brilliant Club scholars*



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The Brilliant Club

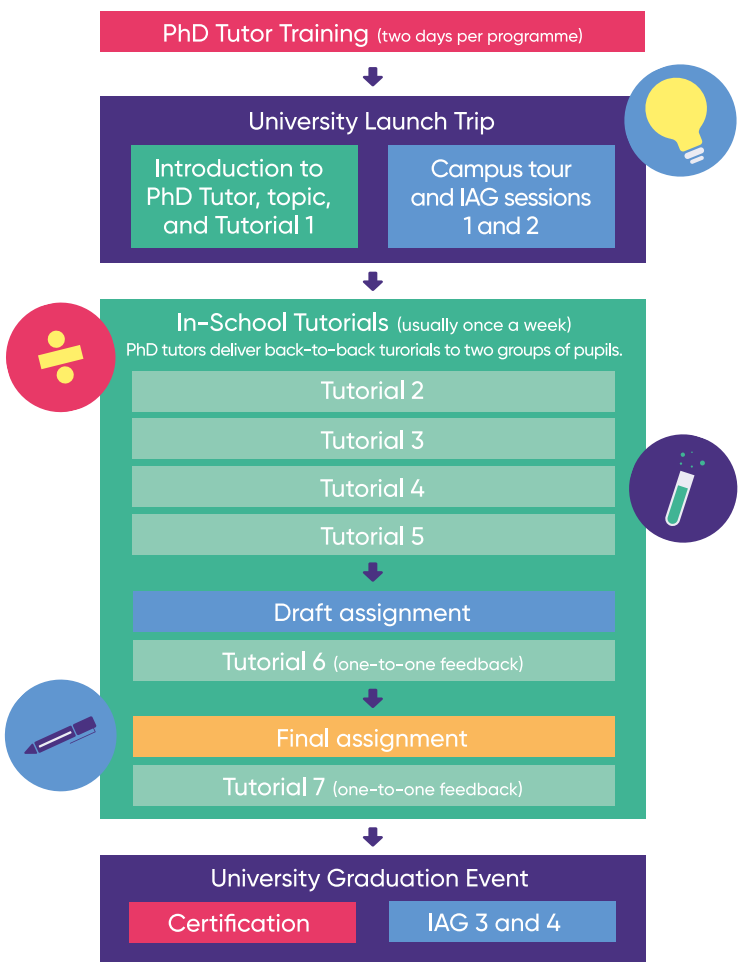
What is The Brilliant Club?

The Brilliant Club is an award-winning charity that exists to widen access to highly-selective universities for under-represented pupils. We do this by mobilising researchers to bring their academic expertise into state schools through two core programmes: The Scholars Programme and Researchers in Schools.

The Scholars Programme trains PhD and postdoctoral researchers to deliver university-style courses with rigorous academic challenges to small groups of pupils. These courses begin and end with information, advice and guidance trips to highly-selective universities.

Researchers in Schools (RIS) is a unique route into teaching, designed exclusively for PhD graduates. It provides the training necessary for PhD graduates to become excellent classroom teachers and university access champions within their schools. Both programmes are designed to support pupils to develop the knowledge, skills and confidence necessary to secure places at highly-selective universities.

The Brilliant Club is building a national movement to mobilise PhD researchers to engage with state schools serving low HE-participation communities. In 2017-18 we worked with more than 12,000 pupils, 645 non-selective state schools and 38 partner universities. Through The Scholars Programme, our PhD tutors deliver courses of university-style learning to pupils from Year 5 through to Year 12. The courses they deliver focus on fascinating topics ranging from 'Are Some Infinities Bigger than Others?' to 'Making Maps, Constructing Worlds: Geopolitics and Geography'. As the diagram to the right shows, The Scholars Programme consists of trips to highly-selective universities, a series of tutorials and the completion of university-style assignments, as well as one-to-one feedback for pupils from their PhD tutors. It is the best of these university-style assignments that are printed here, in The Scholar. We are delighted to showcase our pupils' work and celebrate their achievements in the country's only academic journal dedicated to publishing university-style assignments authored by school pupils. Publishing original work is an important component of academia and it is exciting for us to introduce our pupils not only to the world of research but also to the next stage of publishing in academic journals.



Updates

News from The Brilliant Club

Welcome to the latest edition of The Scholar!

We are delighted to be able to celebrate twenty-one of the best assignments written by pupils on The Scholars Programme and Uni Pathways. The pupils featured in this edition come from schools across the UK and their work covers an array of topics, from 'The Anthropocene v Deep Time' to 'Disease detectives'.

This edition of The Scholar features some of the most impressive articles ever produced by pupils on The Scholars Programme. The university style learning that pupils take part in on our programmes is designed to provide pupils with the freedom to develop their own ideas and approaches. We believe this is a crucial skill for all young people and, indeed, for society itself. By supporting pupils to develop critical thinking and independent study skills, university-style learning can empower young people to share their ideas and engage in the debates shaping our world, whether they concern climate change, diseases and medical ethics or the relationship between nature and literature.

The Brilliant Club is passionate about exposing pupils on our programmes to these important aspects of university. We hope that the projects encourage pupils to dig a little deeper into subjects that matter to them and to seek opportunities to make their unique contributions to their fields. We hope that in doing so, pupils can change their own lives by enriching them with opportunities for learning and be inspired by the topics they cover.

We would like to say a huge congratulations to the pupils published in this edition of The Scholar and to all the pupils who completed The Scholars Programme and Uni Pathways. The programmes are designed to challenge and encourage you to take on new academic disciplines. All of the pupils who graduate from the programmes should be very proud of themselves!

On page five, we share some exciting updates on the launch of Researchers in Schools recruitment, the Seren Conference in Wales, and our exciting work in Northern Ireland.



The map above shows the locations of all pupils featured.

If you are a teacher who would like to find out how your school can get involved with The Brilliant Club, we would love to hear from you! Please get in touch with the contact for your area below:

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Updates

News from The Brilliant Club

Researchers in Schools: Applications Open for 2019

The RIS Programme is a unique teacher training and development programme tailored exclusively to PhD graduates. It is specifically designed to utilise their academic expertise to the benefit of pupils, schools and universities.

We are excited to announce that we are now recruiting for our 2019 cohort. We will be recruiting PhD subject specialists to train to teach EBacc subjects across England, which includes Mathematics, English, Science (Physics, Biology and Chemistry specialisms), History, Geography, Modern Foreign Languages (French, Spanish, German), Classics and Computing. As well as training to teach, our participants deliver high-impact interventions and projects aimed at supporting pupils from under-represented backgrounds to progress to highly-selective universities.

If you would like to learn more about training to become a teacher with Researchers in Schools, or you want to learn more about how your school could work with us, please visit www.researchersinschools.org.

The Scholars Programme Launches in Northern Ireland

In 2018/19, we will be working across all countries in the UK for the first time. We are continuing to grow our reach in Wales and Scotland and in the spring term we will be launching a small pilot in Northern Ireland. In partnership with AccessEd, this will give students from Northern Ireland and the Republic of Ireland the opportunity to participate in The Scholars Programme and undertake joint launch and graduation trips at Trinity College Dublin and Queen's University Belfast.

Seren Conference 2018

We are delighted to be involved in delivering the Seren conference for the third time, on behalf of the Welsh Government. Seren is a network of 11 hubs across Wales which each co-ordinate a programme of activities to support Welsh students to apply and progress to highly-selective universities. The conference will be running over three days with 1,200 Year 12 students participating in total.

The students will have access to representatives from 32 universities from across the UK who will be attending the conference to provide information on studying at their institution and how to apply. The universities will also be involved in delivering a range of information, advice and guidance sessions on topics such as adjusting to university life, future careers, communicating your skillset and standing out from the crowd. Alongside this, students will be able to participate in a range of academic masterclasses, including engineering, medicine, performing arts and politics.

Guest Article

Brilliant Teachers and Changing Lives

Professor Tom Ward

Deputy Vice-Chancellor for Student Education and
Professor of Mathematics at the University of Leeds.

I'm honoured to be asked to contribute a short guest article to *The Scholar*, and particularly delighted to follow my former colleague Professor Jo Fox in doing so. Jo encouraged young women to change the world, and I want to talk about two women, both of whom changed my world in different ways.

The first is my mother, H. She came from difficult circumstances, but several different school teachers encouraged her interest in science. This led to her graduating in Physics from the University of Birmingham in 1947 and a career as a Physics teacher in four different countries. She was interested in everything and gave the whole family a deep and abiding interest in science, mathematics (as well as literature, language, theology, society, gardening...!). She was always ready to discuss ideas, and my own academic journey in some ways started with long conversations about a Victorian-era mathematics book from which I learned the rudiments of calculus.

I also encountered some wonderful teachers throughout my childhood. One of these was a post-graduate student spending a short time back at the school he had attended, where I was then in Sixth Form, and he gave me the confidence to apply to university in the UK to study mathematics. The impact of being taught – even briefly – by a current post-graduate research student was, in hindsight, a foretaste of The Brilliant Club model. He did teach us some mathematics, but more importantly gave a sense of how it is a living, growing, subject.

The second remarkable woman I wanted to mention is my daughter, A. She also developed a strong interest in both science and literature, and after graduating in Physics from Durham University also went into teaching. She is an inspirational teacher and has an impact on the lives of many generations of school children. There are ways in which we see the influence of four very different grandparents in the energy and dedication she brings to her role as a teacher.

I've mentioned these three people – and of course there were many other influential people in my own life – because they illustrate how teaching and mentoring can change directions of entire lives. The Scholar is written by, read by, and edited by, people who understand this and care about what it means. Every school pupil deserves the chance to have those life-changing encounters with new ideas, exciting research, and academic support. A commitment to social justice, and a wish to uncover talent wherever it may be found, means we all need to act to make that possible.

Whatever path your life takes in future, being inquisitive, studying hard, creating and synthesising new ideas, taking advantage of teachers and mentors – all will help shape your future.

Professor Tom Ward



STEM

How many engineers does it take to make an ice cream?

Year 5, Key Stage 2

A. Dhillon, New Invention Junior School, Walsall.
Supervised by B. Johnston, University of Wolverhampton.

Problem

The ice cream that I will be making is a strawberry ice cream and it will hopefully be delicious. My ice cream may have little bits of strawberry but that's fine as it is making my ice cream healthier.

Ideas

I know the ice cream should contain: 4 frozen strawberries (to make it taste like strawberry ice cream), 75 grams of milk (to make it smooth and creamy), 20 grams of yogurt (to make the ice cream thick, otherwise it would be like a milk shake) and 15 grams of sugar (to make the ice cream sweet and tasty), inside my refreshing ice cream to make just right. Another recipe that I could use for 10 – 12 servings is: 500 grams strawberries, 175 grams caster sugar (plus 2 tablespoons), 500 millimetres full fat milk (blue carton milk), 500 millimetres double cream, 1 vanilla pod, 10, large egg yolks and 2 tablespoons lemon juice [3].

The engineers I will need are: biochemical engineers (to put the right amount of ingredients in and they make sure the ingredients go in correctly), chemical engineers (to make sure the packaging is done appropriately and to do a toxicity test on the food item to make sure that it is edible), mechanical engineers to make sure the machines that create the ice cream are functional and working and to make sure the fridges are on and working so the ice cream doesn't melt) and industrial engineers (to hopefully make the ice cream very popular and to allow mass production so lots of people can buy it).

The method I could use is to put all the ingredients in a blender (a biochemical engineer supervising if needed), then I would blend it on setting two (to make it a smooth ice cream) next, I would put it in some sort of bowl or container to eat or sell it in. Another way I could do it is to just put it in an ice cream making machine and let the machine to the process and afterwards put the ice cream in the tub, container or bowl it could be in.

Plan

The way I shall manufacture this ice cream to be the best it can be is simple. First, I will have a mechanical engineer to check the ice cream making machine before anything else.

Then, I will have a biochemical engineer to put the accurate amount of ingredients into the machine. Next, once the ice cream has come out of the machine, I will have a chemical engineer to run a toxicity test on the ice cream, if the toxicity test is successful (to make sure the ice cream is edible) then they would check if the design and the packaging for the ice cream is appropriate. Finally, once the product has finished making, I would have an industrial engineer to hopefully create mass production of the ice cream.

I would use the amount of ingredients as I mentioned earlier for the ice cream that we will make: 4 frozen strawberries, 75 grams of milk, 20 grams of yogurt, and 15 grams of sugar. Another recipe that I could use for 10 – 12 servings is: 500 grams strawberries, 175 grams caster sugar (plus 2 tablespoons), 500 millimetres full fat milk (blue carton milk), 500 millimetres double cream, 1 vanilla pod, 10, large egg yolks and 2 tablespoons lemon juice [3].



Do

The engineers that will need to manufacture the ice cream first is the mechanical engineer as they would need to check the fridge and the machine that would create the ice cream before starting the process of making the ice cream. Next I would need a biochemical engineer to check and put in the correct amount of ingredients into the machine so that the right amount of ingredients goes inside of my product. Then, I would need a chemical engineer so that they can run a toxicity test on the ice cream and to see if it were edible, also they would check the design of the product and the packaging and if it is appropriate and safe for small kids. Finally, I would need an industrial engineer to bring mass production to my product and make it popular then we would make lots of money.

What Is The Most Popular Flavour?

A recent study found that chocolate and vanilla are far from America's favourite ice cream flavours. Although vanilla is the best-selling flavour, it is not the most loved. A Turkey Hill survey found that Choco Mint Chip is the favourite flavour. Cookies n' cream came in last, according to their survey [1]. However, China is now the world's largest ice cream market, which makes sense, because it has the most people. Despite having interesting local flavours like lychee, longan, red bean, and taro, the most popular flavour is vanilla.[2] Another website says that the favourite flavour of ice cream is vanilla in the US [4]. One of the popular flavours of ice cream in the West Midlands is Raspberry Ripple [5]. Whereas another website says that overall in Britain, vanilla is the favourite flavour and raspberry is the 4th in Britain [8].

Improve

As Raspberry Ripple ice cream is one of the most popular ice cream flavours in Great Britain, I will add raspberry syrup to the ice cream, so my target audience is young people because raspberry is red and it is bright and it is sweet so young people will like it. A challenge to make my ice cream is that I would have to buy the ingredients (a pack of raspberries costs £2.50 and strawberries cost £2.60 per pack). My ice cream is healthy as it has raspberry syrup and raspberries have vitamin C, quercetin and Gallic acid that fight against cancer, heart and circulatory disease and age-related decline. Also, it contains strawberries, which have a lot of vitamin C and are a good source of potassium, which is needed for your nerves, muscles and heart; it is also a good source of manganese, which helps form body tissues. [6]



Conclusion

In conclusion, my ice cream will be a strawberry ice cream with small pieces of strawberry, and raspberry syrup. The raspberry syrup is in my ice cream as raspberry ripple is popular in the West Midlands and the reason it is strawberry flavoured with bits of strawberry in it is because strawberry ice cream is fourth in the world. [7].

References

- [1] Business insider UK, America's favourite ice cream flavour isn't chocolate or vanilla, August 14th 2017, Business Insider Website Link
- [2] Smosh, Here are the most popular flavours of ice cream in 6 countries around the world, Smosh Website Link
- [3] Nigella recipes, Strawberry Ice Cream, Nigella Strawberry Ice Cream Recipe Website Link
- [4] Active beat, 15 most popular ice cream flavours: the winner may surprise you, April 2nd, Link = <https://www.activebeat.com/diet-nutrition/15-most-popular-ice-cream-flavors-the-winner-may-surprise-you/>.
- [5] Daily Mail, Info graphic reveals Britain's favourite ice cream flavours, 23rd June 2015, Daily Mail Website Link
- [6] WebMD, Nutritional benefits of the strawberry, <https://www.webmd.com/diet/features/nutritional-benefits-of-the-strawberry>.
- [7] Food Channel, The top 15 most popular ice cream flavours, July 30th 2008, <https://foodchannel.com/2008/the-top-15-most-popular-ice-cream-flavors>
- [8] Ocado, Britain's favourite ice cream flavours, August 5th 2015, <https://blog.ocado.com/2015/08/05/britains-favourite-ice-cream-flavours/>

Problem

I will be making a low-fat chocolate ice cream.

Industrial ingredients

Milk (containing water) = 64%
Non-fat solids = 12%
Fats = 10%
Sugar = 13%
Flavouring (chocolate) = 0.5%
Emulsifier and stabiliser = 0.5%

Homemade ingredients

125ml Milk
125ml Whipping cream
1tbsp sugar
1/2tsp cocoa

Did you know that 64% of adults have a BMI of 25 or over? This is information provided from public health England, who published the data in May 2017. Therefore, I would like to create a low fat chocolate ice cream because I want to reduce that number, especially with a sweet treat. I also think that the ice cream that lots of people like is chocolate so this could attract lots of people, including children. According to the Ice Cream Alliance, the top two most popular ice cream flavours in the UK are vanilla and chocolate. While doing research I came across an article from the Verdict about a lack of vanilla beans due to a cyclone in Madagascar in March 2017 - which is one of the main producers of vanilla beans. Due to this, vanilla is going to be harder to get and more costly, which is why I feel that a chocolate ice cream would be a better option. A low-fat version will also help to tackle the obesity problems of both adults and children.

Ideas: how to make (at school / home)

The ingredients I will use are: milk, non-fat solids, fats, sugar, cocoa, emulsifier and stabiliser, salt and ice.

I think that to make my ice cream in school or at home I will use the following method:

1. Mix everything (the flavouring, sugar, emulsifier, stabiliser, fats, non-fat solids and milk) together in a bowl.
2. In another bowl add the ice and sprinkle the salt on it.
3. Finally, I will sit the ingredient bowl in the ice bowl and leave it to freeze into ice cream.

Ideas: how to make (industrial process)

The ingredients I will use are: milk, non-fat solids, fats, sugar, flavouring, emulsifier and stabiliser.

To make this product in a factory, the following method would be used:

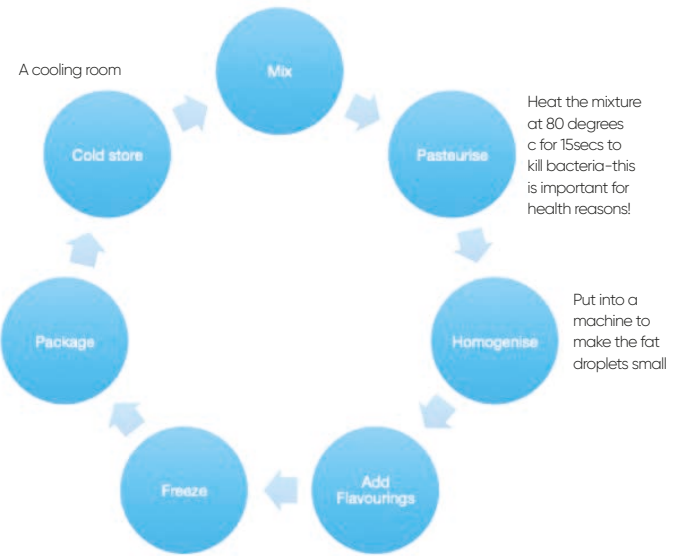
1. Mix all ingredients in a big mixer.
2. The mixture would then need to be put into a pasteurisation machine for 15 seconds at 80 degrees Celsius to kill any bacteria.
3. The mixture now needs to be put in a homogenisation machine to make the fat droplets smaller.
4. After that, any flavourings would be added before it was beaten quickly to add air before freezing the mixture.
5. Finally, it would be packaged and stored in a cold store.

The engineers that I will need to manufacture my ice cream are: a Chemical engineer, an Environmental engineer, a Mechanical engineer, an Industrial engineer, a Civil engineer, an Electrical engineer and a Software engineer.

Plan

I will manufacture my ice cream in the way my diagram shows. As it is a low-fat ice cream my recipe will require low fat ingredients, which is reflected in the recipe where it shows I have used the least amount of fats possible.

I have chosen the name Choc-O-Light as I feel that it gets across the message that it is both low in fat and chocolate flavoured - which should appeal to adults and children. I plan for my ice cream to be packaged and sold in larger tubs-perfect for families, or smaller pots that contain a single serving for people who enjoy ice cream as an occasional treat or those following a low-fat diet.



The roles that my engineers will have are:

Chemical engineers often use science to process things such as chemicals and they could do this to create my emulsifier and stabiliser to keep my ice cream smooth.

Environmental engineers usually help things like improving waste disposal and air pollution but they would give ideas on how my machines could work more efficiently and reduce the pollution level which is important these days as the pollution levels are drastically going up and affecting climate change.

Mechanical engineers most of the time focus on applying engines and machines to design things and to make ice cream they would create and design the machines that produces the ice cream while trying to minimise the use of energy and CO2.

Industrial engineers mostly make systems more efficient and get rid of wastefulness and in the ice cream production process they would perform theoretical analysis and taste my product.

Civil engineers design things such as dams, bridges, buildings and roads. For me, they would create the factory I would manufacture my ice cream in.

Biomedical engineers make things safe to eat and to do that they use things like diagnostic equipment. For the ice cream production process they would make sure my ice cream doesn't contain harmful substances that could give you food poisoning.

Electrical engineers create lights and measure how much electrical power would be required for each floor or room to power things. In my factory they would design the lighting and power systems - which is crucial as I could not produce ice cream in a powerless factory.

Software engineers would usually design and create code. In the ice cream manufacturing process they would design and test the code that my machines run on.

Improve

My target audience for this ice cream is those who enjoy eating ice cream but would like it to be a healthier treat. Choc-o-Light would appeal to them because it is a low fat product. The challenges would be sourcing the lowest fat ingredients but still keeping the great flavour and also being able to source the best cocoa powder possible.

Conclusion

The question for this assignment was 'how many engineers does it take to make an ice cream?' In conclusion, I think it takes 8 different types of engineer to make my ice cream but many more people as the engineers would need to work in teams in order to work efficiently and produce enough ice cream to make sure I could meet customer demand - and therefore make myself rich!

References

- The verdict newspaper
- www.sciencekids.co.nz
- Public health England
- The Scholars Programme course handbook

PhD Tutor's comment:

C. was a fantastic student to work with. He contributed effectively to discussions in tutorials, coming up with excellent justified ideas - something I think is reflected in his assignment. He also completed an impressive amount of additional research on his engineering topic and produced an outstanding piece of work. Well done C!

World Health Organisation: Strategy to Contain an Outbreak of Malaria in Franklin Village, North East South Africa

Year 7, Key Stage 3

A. Kerbel, Beauchamp College, Leicester.
Supervised by L. O'Regan, University of Nottingham.

Franklin Village is located just west of Legalameetse Nature Reserve, south of Tzaneen, near Polokwane, South Africa [1]. While this area has not, in the past, been endemic (at risk of a disease) with malaria, just east has been. The South African government has been taking several measures in the three provinces in which malaria is endemic. This includes the necessitation for all malaria cases to be reported and confirmed through microscopy analysis [2]. The outbreak has been confirmed through this method on day 11 of infection for two cases. It was diagnosed from locals who recognised the symptoms (bodily changes caused by the disease) and requested a blood test.

Malaria is caused by the parasite Plasmodium, which is carried by the female mosquito [4]. In South Africa, it is usually the Plasmodium Falciparum which causes the disease [2]. Humans are infected when bitten by a mosquito hosting the parasite. Symptoms of malaria include headaches, fever and chills, at about 10-15 days after initial infection. These may progress to yellow skin, seizures, coma and death [4]. Malaria is not a contagious disease (spread between people), but the infection rate of mosquitoes infecting humans is, in this case, two infections per day (note that this is based on only the cases which have been diagnosed in this outbreak and there may be more cases which we are not aware of). The contact rate of mosquitoes biting humans is currently unknown.

A map showing the risk of malaria in South Africa [3].



MALARIA RISK MAP FOR SOUTH AFRICA

To significantly reduce your risk, take precautionary measures against mosquito bites throughout the year in ALL RISK areas. Where malaria chemoprophylaxis is indicated, mefloquine or atovaquone-proguanil or doxycycline should be used.

- Low Risk**
Only non-drug measures to prevent mosquito bites are recommended
- Moderate Risk**
Antimalarial drugs are recommended from September to May for all travellers
- Malaria risk does exist in neighbouring countries** For further information, please consult the WHO travel health guidelines at <http://www.who.int/ith/en/>

These may progress to yellow skin, seizures, coma and death [4]. Malaria is not a contagious disease (spread between people), but the infection rate of mosquitoes infecting humans is, in this case, two infections per day (note that this is based on only the cases which have been diagnosed in this outbreak and there may be more cases which we are not aware of). The contact rate of mosquitoes biting humans is currently unknown.

Malaria is difficult to control because it is not spread through contagion, so quarantine (the separation of the infected and uninfected) is not effective. Possible interventions include malarial vaccinations [4], insecticide treated bed nets [5], anti-malarial medicine [4] and insecticide [4]. These interventions have varying effectiveness, but also varying cost.

Vaccination (a preventative medicine to trigger the production of antibodies) as an intervention against malaria has a moderate effectiveness rate of 31% for the SPf66 vaccine [6] and 30.1% for the RTS vaccine [7] against Plasmodium Falciparum (these are both for specific age ranges in certain countries, so may not be reliable in this situation). However, it is expensive, and not very cost effective [8]. Insecticide treated bed nets are more cost effective than vaccinations, with an effectiveness of 49.7% (calculated from the incident rate ratio) [5]. The approximate cost is \$1.40 per person, per year of protection [9]. Anti-malarial medicine is a treatment, rather than a preventative intervention, with a cure rate of 93.9% in infants and children (this is with co-artemether) [10]. However, the use of a treatment means that malaria must be diagnosed in the first place.

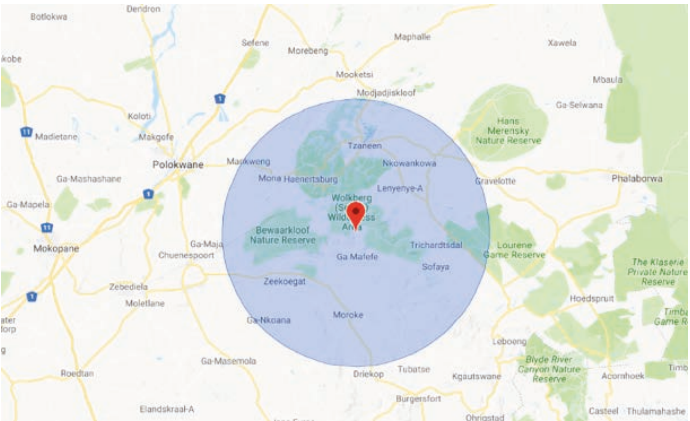
Insecticide can also be used as an intervention against malaria. Whereas the interventions above prevent or treat malaria through the prevention of mosquitoes having access to humans to infect them or prevent/stop them being able to be hosted by humans, insecticide eliminates the mosquitoes in the first place, meaning that the parasite, Plasmodium Falciparum, does not have a host to enable it to spread. This means that one, all-encompassing use is sufficient to eliminate the disease, therefore reducing

the long-term cost. However, insecticide does have side effects, including dizziness, coughing, sneezing, numbness, blurred vision, itching and watery eyes [11].

I have decided to use insecticide as my primary intervention, because it limits the long-term cost, as only one use is necessary. Also, it is extremely beneficial to the South African economy, as 9.3% of it is made up of the travel and tourism sector [12]. Having malaria endemic in large parts of country would be likely to significantly reduce the number of tourists entering South Africa, having negative effects on their economy.

I am going to contain and control this outbreak in Franklin Village, North East South Africa using insecticide as my primary intervention. I will attempt to permanently eliminate the mosquito, and therefore the Plasmodium Falciparum, in the area. While this is expensive in the short-term, malaria is a life-threatening disease and 'countries with intensive malaria had income levels in 1995 of only 33% that of countries without malaria' [13]. The eradicating of malaria in the area is therefore worth the significant upfront cost.

This outbreak was diagnosed on the eleventh day of infection for two cases in the same village. The infected people lived half a kilometre apart, and both had not left the location on the day they were infected. Bearing this in mind, we can therefore calculate the distance the infected mosquito/mosquitoes could have travelled, based on their maximum flight range on a blood meal, which is 10km (this of the Anopheles gambiae, the most common mosquito vector in the area) [14]. Mosquitoes must rest for about two to three days after a blood meal, before flight [15]. Calculating on two days, the mosquito/mosquitoes which infected the two cases in Franklin Village could have travelled 50 kilometres (you must round down, as a mosquito cannot rest one day, then fly 5km).



This map shows the furthest possible distance any infected mosquito/mosquitoes could have travelled. [16]

I am going to use the following interventions to contain and control an outbreak of malaria in Franklin Village:

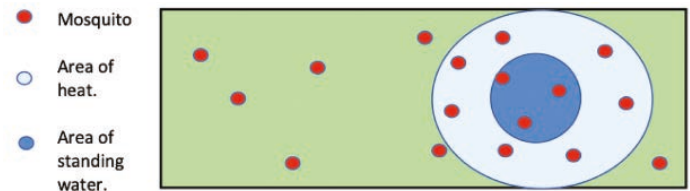
- The release of insecticide from aircraft in the area shown in the map above.
- The distribution of insecticide-treated bed nets as a short-term measure, in the area marked above and the surrounding area.
- Effect a programme of regular blood screenings for the people inside and surrounding the marked area.

The set of interventions that I am going to use will work because insecticide released from aircraft will be able to cover the whole area affected, so there will be no mosquitoes left to host the Plasmodium Falciparum. No one will be able to be infected in the area, meaning that the area will not become endemic with malaria.

The disease will not be able to spread further into the country. The distribution of insecticide treated bed nets will prevent any new infections until the mosquitoes have been eradicated, at a relatively low cost. Finally, if I am unsuccessful in eradicating the mosquitoes in the Franklin Village area, I will be alerted to this due to the programme of regular blood screenings.

Another approach to the eradication of mosquitoes in the Franklin Village area would be to attract the mosquitoes to certain areas, before releasing insecticide in these areas only. This would mean that the side-effects of insecticide could be avoided, as you could choose largely unpopulated locations as the 'traps'.

One way of attracting mosquitoes would be through the artificial production of heat in certain areas. Mosquitoes are attracted to areas of heat because the speed of egg development 'depends on temperature' [15]. Most female mosquitoes 'do not live more than 1-2 weeks in nature' [15], so rapid egg development is of great attraction to them. Also, you could choose areas with standing water, such as lakes, which naturally attract female mosquitoes because they are good environments for them to lay their eggs. This would allow you to attract mosquitoes to these areas, where you could then use insecticide to eradicate them. However, attracting mosquitoes through the production of heat at locations with standing water is unlikely to be effective, as it is not a reliable method. While some mosquitoes may be attracted, it would be in no way comprehensive.



An example of the possible spread of mosquitoes.

Also, a high amount of energy would be required to produce the necessary temperature difference, meaning that this intervention would be very expensive. Furthermore, the heat produced would be likely to disperse over the surrounding area, creating no temperature difference at all.

Another method of attracting mosquitoes to an area or areas would be through the production of either audible or ultra sound, imitating the noise made by the male mosquito. Malaria is only spread by female mosquitoes [4], so this would attract all the mosquitoes which could carry malaria. However, reproducing the sound created by the male mosquito would be ineffective, as a high amount of energy would be required to produce the sound. Also, the volume could be dangerous to human populations.

A third way of attracting mosquitoes would be by placing sterilised animal blood such as cattle blood in certain areas. This would attract mosquitoes to these locations, which could then be sprayed with insecticide. Mosquitoes do sometimes drink the blood from animals such as cattle [15], so this strategy could be effective. However, I do not think this strategy would be ineffective in practice, as the Anopheles gambiae is 'strongly anthropophilic' [15], meaning that it prefers human blood to animal. Therefore, it is unlikely to be attracted to the chosen location when it can also access human blood.

In conclusion, I am going to contain and control the outbreak of malaria in Franklin Village, North East South Africa, by releasing insecticide from aircraft in the area which any mosquito could have travelled to since the initial infections. I will also distribute insecticide-treated bed nets to that area and the surrounding areas and put in place a programme of regular blood screenings in these areas.

The eradication of mosquitoes in the Franklin Village area could have side effects for humans, including those listed earlier. It is important to remember that removing the mosquito from the food chain could have catastrophic effects, as a chain reaction would occur. Predators of mosquitoes, such as some spiders [17], would have no prey, and therefore their predators would be without prey.

While side effects for humans are unavoidable for my suggested interventions, the environmental effect, to the food chain, could be dealt with through artificially producing food for the predators of the mosquito, and gradually reducing the quantity available to them until they adapt to other prey. In this way, the food chain could be kept intact while eradicating the mosquitoes in the Franklin Village area. Therefore, I suggest using insecticide as a primary intervention, in combination with the others listed above.

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PhD Tutor's comment:

A. is a brilliant student and an absolute pleasure to teach. He was always very interested and engaged in tutorials and had lots of ideas to contribute during class discussions. His essay really stood out as he made excellent use of diagrams and figures to supplement his writing, as well as including an abundance of fascinating facts that he had researched independently. He received a top-class grade for this essay, meaning that he is already performing to GCSE standard at this very early stage! I have no doubt that his natural curiosity will lead him to excel at anything he puts his mind to in future.

Outbreak of Malaria 'Franklin Village'

Year 7, Key Stage 3

H. Siddique, Forest Gate Community School, London.
Supervised by Z. Morbach, University of Roehampton.

Overview

The recent outbreak of malaria in this rural village has become a concern for the WHO (World Health Organisation). The agency is concerned with public health and is actively involved in the prevention, control and treatment of malaria. Malaria is a life-threatening disease spread by mosquitoes which can be fatal. One can become infected by a single mosquito bite. Symptoms include fever, sweats and chills, headaches, vomiting, muscle pain and diarrhoea.[1] Malaria is spread via a parasite and is not a contagious disease. It is difficult to control as mosquitoes are tiny insects which travel indiscriminately.



Therefore, when devising a strategy to help prevent further outbreaks, it would be prudent to identify 'hotspots'. These hotspots would be identified as areas around the village where mosquitoes tend to congregate. Around a rural village such as Franklin Village, this would be anywhere there is standing water such as the edge of rivers, lakes and ponds. Other factors to consider when dealing with how to combat outbreaks would be other interventions available such as nets, insect repellents and anti-malarial medications. All these deterrents are not equally effective, and we must evaluate what combination of controls should be introduced.

Why is Malaria difficult to stop?

As mentioned previously, malaria is a difficult disease to stop. There is no vaccination that offers protection, anti-malarial medicine can be used to both prevent and treat malaria. However, anti-malarial medication only reduces the risk of infection when taken as a precaution and the malaria parasite is very good at becoming resistant to these medications.

Dengue, Yellow Fever and Zika virus are life threatening diseases with devastating consequences that are also spread by mosquitoes. Hot, humid environments are favourable to mosquito growth making countries with tropical climates most likely to suffer with infestations.[2] Dengue fever is a virus spread by mosquitoes and can be potentially life threatening: the Yellow Fever virus is a strain related to Dengue fever and results in similar symptoms. 360 million cases occur with 90 million resulting in infection with symptoms ranging from a high fever, damage to blood vessels and failure of the circulatory system in more serious cases.[3] Dengue transmission spread from Southeast Asia into surrounding sub-tropical and tropical Asian countries, Southern China, the Indian sub-continent and Siri Lanka, and down the Island nations of Malaysia, the Philippines, New Guinea and several pacific islands.[4] The Zika virus is another disease spread by mosquitoes.

Contraction of this disease is especially harmful in pregnant women as it can result in children being born with servere birth defects. These include an abnormally small head and brain causing developmental issues throughout the child's life.

Taking steps to avoid being bitten is therefore vitally important. Bed nets are extremely effective at preventing mosquito bites which can occur during the night but cannot protect during the day. There are many insect repellents available which have been widely used across Africa and Asia. In general, they are considered a good defence against insects biting during the day. They can be sprayed on the walls of houses and communal buildings and a topical repellent can be applied to children, those who work outdoors and the sick or elderly.

My approach:

My approach for Franklin Village is two-prong, in treating the host (human) and the parasite/vector (mosquito). Firstly, when tackling the mosquito, two of the most effective tools employed could be the mosquito nets and spraying of insect repellents. The repellent will kill mosquitoes when they rest on the walls after biting. It is important to remain strategic in our approach when spraying. Public/communal spaces where there is a high traffic of people would be sprayed as a priority. At the same time, smaller areas of standing water such as pools, fountains and ponds and could be drained and sprayed.[5] The most effective insect repellents are based on DDT (Dichlorodiphenyltrichloroethane) and Picaridin. Points to consider when using these types of sprays are safety, cost and resistance. Certain environmental groups do not endorse the use claiming that the amount of time (lasts for 8-12 months) it remains in the environment makes it a dangerous pollutant. The EPA (Environment Protection Agency) says it damages the liver, the nervous system and can also make people infertile. Although in countries where malaria has reached epidemic levels, DDT has been a life saver, seeing a significant reduction in the disease. It is imperative when using any type of chemical spray that usage guidelines are strictly adhered to avoid overuse. Sprayers should undergo full training to maintain safety.[6] In 2004, at least 3950 tons of DDT was sprayed for mosquito control in Africa and Asia. Another challenge that has become evident over time is insecticide resistance. Some insects may carry the genes for resistance and subsequent mosquito offspring may be less affected. To combat this, it would be wise to use different mixtures of sprays (safety verified) whilst rotating their use in different areas, not using the same spray in one area when it needs respraying after 8-12 months. Affected areas are often vast and the cost is a major issue to consider, in this respect, DDT sprays are perceived as the most cost-effective way to combat malaria.

In addition to insecticidal sprays, I would also organise treated mosquito nets to be distributed amongst the public. These could be either delivered to households or given out from a public building (which has also been sprayed).[7]



Spraying of public areas with insecticidal sprays such as DDT (Dichlorodiphenyltrichloroethane) to control the spread of malaria.

Nets cost about \$2 and last for 3-4 years protecting two people on average during the most crucial hours from 10 o'clock in the evening and onwards. The nets not only offer protection against malaria but also diseases such as dengue fever, yellow fever, zika virus and various forms of encephalitis. Nets treated with insecticides has been proven to be an effective method of protection.[8] According to a 2015 nature study, mosquito nets averted 68% of an estimated 663 million cases since 2000. Of course, nets are not fool proof or void of their own challenges. Many people (especially children) do not like sleeping under a net, especially when conditions are hot and humid in places mosquitoes thrive. Therefore, ensuring the use and educating the population as to why they must be used consistently is something to be considered. In addition, nets do not last forever, generally, they have a lifespan of 3-4 years before they must be retreated or replaced.

The second prong in my approach involves the treatment of the residents of the village. Diagnostic testing would be arranged at the local health centres for all residents.[9] When a mosquito bites a human host, the parasite enters the bloodstream and resides in the liver for some time. The symptoms typically begin 8-25 days after infection or in other cases, weeks and months later. Therefore, effective testing determines patients who test positive for the disease as only those who are affected will be treated with anti-malarial medicines, reducing the chance of drug resistance occurring. The threat of drug resistance is emerging in the fight against malaria but until an effective vaccine is created, anti-malarial drugs are still considered to be the best option. It is crucial when administrating these drugs that correct usage is promoted and education for patients (in the form of leaflets or talks at the health clinic) must be delivered stressing the importance of responsible use of the drugs in an effective regimen.

I believe the combination of these interventions would definitely reduce occurrence rates and shrink risk to more controllable levels. They are also cost effective which is a vital factor to consider when dealing with a population.

Conclusion:

Of course, the fight against malaria is ongoing as its re-emergence in its different strains poses a national threat to many countries. Practical intervention becomes obsolete unless the people afflicted are informed of risks and good practices. As discussed, each intervention has its advantages and disadvantages proving that no one intervention can conquer malaria. In addition to education, those who live in afflicted areas need to be assisted in developing sustainable solutions which do not damage the environment in an adverse way. It is vital governments enable their population to do this by implementing strong systems to both prevent and control outbreaks and that impoverished nations are assisted by the global health community to alleviate this ongoing threat.

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PhD Tutor's comment:

I really enjoyed teaching at Forest Gate Community School as both staff and students were super friendly and engaged. H. wrote an outstanding essay on the topic of disease transmission prevention using malaria as an example. I was delighted to see how well he used the taught vocabulary and concepts, and especially how well he was able to examine the chosen strategies from different perspectives. His level of writing and use of language is exceptional for his age!

Showing the Impact of Diseases, Potential Treatments and How to Sustain Them

Year 7, Key Stage 3

S. Young, Whitcliffe Mount School, Cleckheaton.
Supervised by L. Nelson, Newcastle University.

Diseases are conditions which can harm the structure of a human body and can pose a fatal threat to the life of said person. All diseases are spread through one of the four main infectious agents: bacterium, viruses, parasites and fungi. Malaria is a disease spread by the infectious plasmodium parasite which chooses the mosquito as its host [1]. It infects the bloodstream following a bite from the female mosquito using the red blood cells to make its way towards the liver. Here the parasite becomes even more developed before it enters the bloodstream once again [2]. Common symptoms of malaria are a "high temperature, sweats and chills, headaches, vomiting, muscle pains and diarrhoea" [3]. These symptoms (i.e. signs you have contracted a disease) can last anywhere between seven to eighteen days but there can be some long-term symptoms that last up to a year or, occasionally, longer [4]. The flu is a more common disease that can cause less catastrophic effects to a person's health but can spread very quickly as it is an airborne disease and stays on surfaces for twenty-four hours after coughing and sneezing has occurred [5]. Unlike malaria, flu is a virus that survives on surfaces and in the air and does not need a host (i.e. a person or animal that can be infected by a germ) to survive. Flu is caused by the influenza virus which is not like malaria, which is a "parasitic infection" (i.e. an infection or disease carried by a parasite) [6]. Both these diseases could have a devastating effect on any settlement despite its population size.

The task we have been set for the final assessment is a challenging one – assign a role in WHO (World Health Organisation) and choose whether to save one of two under-developed settlements in Africa - Franklin Village or Fleming City. It may seem like an easy project, however, there is one big complication that could greatly influence the decision we end up making and what would end up being the most effective choice in the foreseeable and distant future. The major concern is that the village has a case of malaria and the city has a case of flu that could cause varying degrees of damage to the population of these settlements. The main aims in this assignment are as follows. To save as many people within the allocated twelve months as possible using the £5,000 budget we have been granted. We will also create a plan to save any neighbouring settlements if possible by preventing the infectious agents from infecting people and containing the disease inside the chosen location. As well as this, we shall attempt to provide the residents of the chosen location with the most appropriate defences against potential infection while still thinking of the budget and the long-term effects of those chosen defences.

The settlement I have chosen to treat is Franklin Village as malaria can have long term symptoms that often result in death ("584,000 deaths in 2013") [7]. It is useful to know how many deaths have occurred in previous years, so we can measure how effectively our current plans are working. On the other hand, flu is a far less dangerous disease that can be dealt with more easily in a city where there is high chance of being able to resolve the problems with small amounts of medical attention. Despite this, flu is still very contagious, and it can prove fatal, especially in young children and the elderly [8]. All this information attributed to my decision as to which place to treat. In this assessment, I will express the validity of my choice and shall make arguments and counter-arguments throughout.

To carry out the most effective and casualty-free program, a plan is needed to see any possible errors in original ideas. The first stage of the plan would be to send a package with malaria precautions (i.e. ways to prevent diseases) and doctors to the village. The second step would be to make use of these precautions to protect the village and attempt to contain the disease. Finally, I shall explain how we can change this program in the future, how we could make it sustainable (i.e. able to carry on) and how we could carry it out in other villages, towns or cities in the future.

Firstly, we would have to use around £1,000 of the budget, covering travel costs for return flights from £412 each for a pair of doctors to treat the village members [9]. It would be necessary to fly doctors over as some of the treatments, methods and equipment are best to bring from overseas due to restrictions in where certain medical equipment can be obtained. This money could also cover the costs of travelling to the actual village using the means of transportation available. Although the exact location of the village is unknown, we could infer it would be within a drivable distance. Secondly, we would have to use another £1,000 for the thirty days in Africa the flight provides, a tent to stay in and food to eat. The retail price of a durable tent (The Hi Gear Enigma Elite 5 tent) is £260 [10] and the average weekly shop is around £57 [11] which is information needed to budget the amount of money to give the doctors, so they can live healthily. The rest of the living cost for the doctors would also be covered by this money. We would need to allocate this money to protect the doctors from malaria too using precautions such as anti-malarial tablets (£110 for two people and for thirty days) [12]. That is all the information and budget planning required to set up the program and it can all be used to provide credibility to my argument and prove that it is crucial to know how to correctly plan out the costs of living for the program.

The second step is to use the precautions brought with the doctors to contain the disease by quarantining (i.e. separating any infected people or animals from one another to help slow down the further contamination) Franklin Village with as few casualties as possible along the way. £500 should be allocated to medical equipment such as needles, face masks and storage units among other items. However, the main portion of the budget will be spent on the quarantining plan of the village. There shall be two main ways to de-contaminate the village: These include separating the village into two halves – uncontaminated (i.e. not caught a disease/infection) and contaminated (i.e. has caught the disease/ infection) which can show us who is susceptible to infection as it would be useful to know this, so we could know who to treat. The second method would be to introduce natural predators of mosquitoes into the wild.

The village would be separated into two using a border that could either be painted or physically placed. The budget for this border would be £500 including a watch point where the doctor who is not medically attending to the disease could supervise. Although there is no actual cost for a border, £500 will be enough to cover the basic expenses including signing to warn of potential disease spread (i.e. how an infectious agent passes from one to another). The other step to quarantine is stopping the mosquitoes from reproducing and keeping the original mosquitoes inside the village. This will be achieved by spending £750 on fish (guppies) for ponds, streams etc to prey on mosquito larvae so they do not mature enough to carry the disease [13] and by purchasing bags of bird seed to scatter around the perimeter of the settlement and attract birds which kill mosquitoes. These will cover a large area which fish cannot get to. [14]. The guppies cost around £200 for fifty [15] and the bird seed costs around £400 for three different types with two types having twenty bags (£8 each) and one type having sixteen bags (£5 each) [16]. Finally, £100 will go towards mesh covers for any water wells in the village,

so mosquitoes cannot breed in them and spread malaria. On the other hand, these methods could be challenging as wild animals are very unpredictable. It could also be a challenge as there could be people who do not obey the border and could cause a person to become ill or hurt.

My final method is treatment (i.e. medical care given to someone who has contracted an illness/disease) and precaution which is possibly the simplest and most effective method to be used. I would invest the remaining £1,250 of the budget into this plan to allow it to succeed. The first method involves providing the villagers with mosquito spray which is extremely effective as a defence to use on your skin, houses and anything else that could need protecting. Affordable bug spray costs around £4 per bottle [17]. The second step to take would be providing bed nets for the inhabitants so they can be protected when they are vulnerable (i.e. susceptible to becoming infected) such as when they are sleeping or resting. Bed nets cost around £4 [18]. These prices mean that WHO would be able to afford one hundred and twenty-five bottles of insect repellent and one hundred and eighty-seven bed nets to be shared out amongst the village. The average family in a village has twelve children (plus two parents) [19] so each family (around thirty-five families) of the five hundred people could have three bottles of mosquito spray with bottles left over and families could have five bed nets each with spare nets in case of damage to the originals. There would be a collection point set up by the doctors where these could be obtained and there would also be a system of checking which families have had their allocated precautions and which ones haven't, so everyone could collect their allocated amount of precautions efficiently.

This year, there will be a more effective vaccine (the only currently approved one is 26%-50% effective) that will also, most likely, have a clearer price and will hopefully be purchasable all over the world which will mean they can serve as sustainable precautions [20]. This would mean that vaccinations will become a reliable method of treatment and could save a lot more people. The future could also bring more budget towards the program from crowdfunding and charity work to raise funds. These new funds could contribute to making this program sustainable by treating the surrounding villages to further quarantine the parasites inside the original village in the hope that we can eradicate malaria from the area. In the future we would hope that, when we have treated all the villages with malaria, we can treat the city with flu with the annual funds to fully de-contaminate the area from potential infection and disease spread. Although flu is still a challenge to treat, malaria is a far more costly and hazardous disease to medically attend to, so we could eradicate flu by using herd control (i.e. using vaccinated people as a barrier so that non-vaccinated people will have a completely cost-free defence). Other low-priced ways to treat flu include ibuprofen and paracetamol, keeping warm, resting well and drinking plenty of water [21]. These are completely different to anti-malarial precautions such as malarone (i.e. anti-malarial tablets) which is very expensive as well as the other malaria precautions which amount to a high cost [22], [23], [24].

In conclusion, I have decided to save Franklin village using the knowledge I have obtained during the tutorials and explained how my plan will be carried out. I have also explained how much money should be dedicated to different areas of the program. The third area of my essay showed the methods used to treat the disease and quarantine the village. I showed precautions and treatments used to treat malaria such as malarone, insect spray, mosquito nets, natural predators and covering water sources as well as talking about the methods we can use to treat the flu such as ibuprofen and paracetamol, keeping warm, resting well and drinking plenty of water. Also, I explained how I could improve my plan in the future by taking advantage of up

and coming technologies such as malaria vaccinations and by thinking of ways to raise money to carry on the program sustainably. Penultimately, I showed how malaria is treated when compared to the flu. Finally, I compared the treatments of malaria and flu and also the price of those treatments.

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PhD Tutor's comment:

S.'s essay blew me away. His input through the tutorials was impressive and he made me question things along the way too. His essay reflects not only an improvement in his knowledge and academic writing, but also in his ability to think outside of the box and reach for the higher grades in doing so, achieving a 1st for this piece of work. I believe S. will go on to do brilliant things and it was a pleasure to teach him.

NIRS Application to a Triathlete

Year 8, Key Stage 3

E. Owen, The Macclesfield Academy, Cheshire.
Supervised by A. Imere, University of Manchester.

Introduction

Near infrared spectroscopy (NIRS) is an analytical technique that uses the near infrared area of the light spectrum which is between visible and ultra violet light (from 780nm to 2500 nm) [1].

Near infrared light was discovered by William Herschel in the eighteen hundreds, but the first industrial application began in the 1950s. Originally, NIRS was only used as an add-on to other optical devices. Later, developments in light-fibre optics and the monochromator-detector allowed NIRS to become useful in scientific research [1].

There are many industrial uses for NIRS. These include: agriculture. e.g. determining the quality of products; material science. e.g. research into the optical characteristics of nanoparticles; medical and pharmaceutical advances. e.g. brain scans; and industrial uses. e.g. getting accurate CO2 consistency [1].

Since 2006, NIRS technology has become more widely used to assess changes in metabolism and oxygenation of the muscles. This can be done both during and after exercise in the laboratory and in real-life sports situations. This allows athletes to see where they could improve their muscle use to increase their performance [2].

This essay will explore the design of an NIRS product that measures oxygen levels for a triathlete.

Problem

The NIRS product will be developed for a Great British triathlete, Alistair Brownlee. He is thirty years old and comes from Leeds. He is the first triathlete ever to retain two Olympic gold medals and has completed the Iron Man, a triathlon contest [3].

Alistair will benefit from measuring oxygen levels in his blood because he will know how well his muscles are working. Muscles need oxygen to complete aerobic respiration and a lack of oxygen causes anaerobic respiration, which produces lactic acid, causing muscles to fatigue [4]. Therefore, knowing his muscle oxygen levels will allow him to adjust his training to improve performance. Furthermore, Alistair could measure his readings during a triathlon, enabling him to adapt his effort both during the event and in subsequent triathlons.

A standard Olympic triathlon consists of 1.5km of swimming, 40km of cycling and 10km of running [4]. As a triathlon consists of swimming, cycling and running, any device designed for Alistair would have several specific requirements. These include being waterproof; compact; durable; lightweight; and reliable and not falling off when his wetsuit is removed.

Ideas

A common method to measure oxygen levels is through the use of pulse oximetry. Like NIRS it is non-invasive. An example device is the finger pulse oximeter, which, when in use, is attached to your finger and instantly gives an oxygen reading from your blood [5]. However, the reading is only of the oxygen level in your blood, not directly in the skeletal muscle. In addition it does not measure metabolism.

NIRS is a superior technology in the fact that it is possible to measure the oxygen saturation level in specific muscles not just in the blood and NIRS also can measure metabolism. In addition, NIRS can be placed anywhere, not just on the end of your finger.

The next important factor to consider is how the NIRS device should be attached to the triathlete design. For instance, the device could be integrated into the clothing or could be a wearable device using a strap to keep it in place. As triathletes predominantly use their legs, the near infrared light needs to be applied onto the legs. It could also be beneficial to measure oxygen in the arm.

An obvious design is to use small, sticky pads to attach the NIRS device to a leg muscle. However the stickiness would likely fail because the water would reduce stickiness when swimming. Also moisture from sweat would have a similar effect possibly resulting in the device being lost. This problem could be overcome by strapping the device onto the thigh, however, this may be uncomfortable.

The next key factor to consider is how the data will be transmitted and stored. It would be useful to send the data long range to a main processing unit which would store the data in the cloud for experts to analyse. However given that it is likely that multiple NIRS devices would be required, for example on the legs and arms: it would be inefficient for each NIRS device to send it's data remotely. Therefore, the wireless NIRS devices need to send data to a small, local computer such as a smartphone or watch. This would also allow the athlete to access the important data in real-time.

The final factor to consider is how the data will be used. The data needs to be analysed offline by experts so that a new training regime could be created for the athlete based on the data. However, the triathlete will want to monitor their oxygen levels during exercise so that the athlete can adapt their effort levels during the event. This could be achieved through creating a smartphone application [Fig. 1].



Fig 1: [6] An existing NIRS muscle oxygen level monitor combined with a linked smartphone application.

The device is called 'TriView' because you can view your muscle oxygen levels and metabolism in all the three sports in a triathlon (running, cycling and swimming).

To address the problem of attaching multiple devices, a trisuit (which is what most triathletes wear when completing a triathlon [7]) will be modified to contain the NIRS devices, in both the legs and arms, ensuring that it would not fall off when swimming.

As the NIRS devices are located directly on the limbs, the near infrared light does not need to travel anywhere, hence there would be no need for optical fibres. In addition, there is a small Bluetooth device inside the NIRS devices so that the data can be directly transferred to the Display Pad. As the data is not being transmitted long-distance, not much power would be consumed during this process, hence only a small battery will be required.

The NIRS device requires a light source, sending light into the tissue. This is achieved using a single-colour green LED because the single colour is easier to process. A laser would be not be used as it is potentially harmful and would use too much power.

The NIRS devices must also contain a spectrometer which would separate the scattered light [8]. In addition, a photodiode must be included and is required to convert the light waves into electrical currents so the data can be transmitted [9].

The second main component of the TriView device is a computer comprising of a data display; a large, highly flexible screen which would be integrated into the arm of the trisuit. The computer also consists of a Bluetooth receiver (to collect data from the NIRS devices) and also a 4G transmitter[10], to transmit data to the cloud.

The computer and display would be integrated onto the trisuit to make it secure. The display will show real-time data of the oxygenation and metabolism allowing Alistair to see his readings during a triathlon enabling him to adapt as necessary during the event [Fig. 2]. The the display pad (computer and display) and NIRS devices would have to be waterproof.

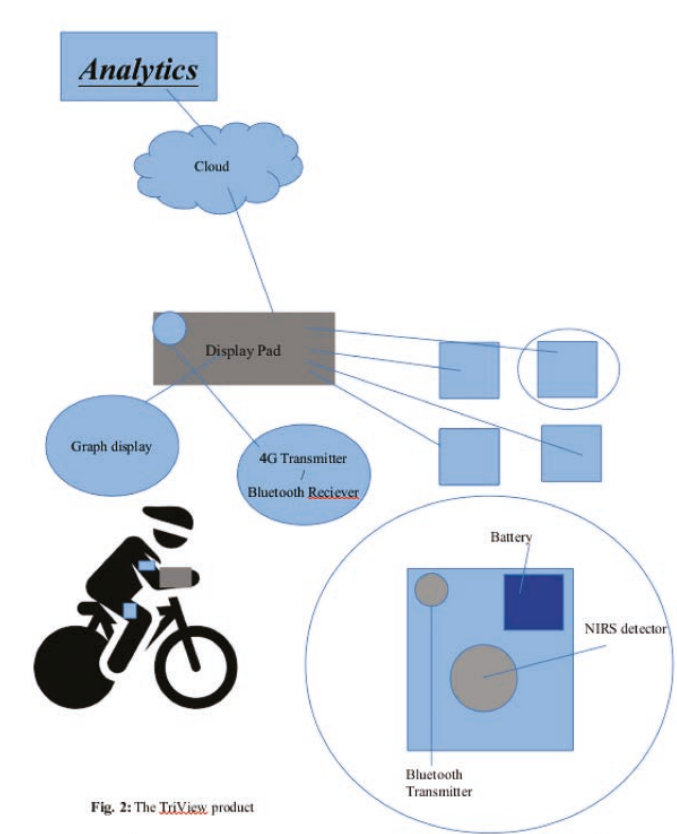


Fig. 2: The TriView product

Improve

The device could be refined in many ways. One issue is the effect of sweat on NIRS data therefore the data is less accurate for high intensity work-outs [14]. This could be improved by adding sweat collecting areas around the small devices in the trisuit. Another way to solve the problem is introducing indocyanine green dye. This has to be applied through an injection so it could be applied before training. The dye improves light scan results which could help for high intensity work-outs [15].

The device could also be improved by adapting the device for other athletes for example a skier. Although, this could be challenging as the design may not work in colder temperatures.

As power may fail, an electrical dynamo could be implemented, using the athlete's kinetic energy to power the devices or recharge the batteries [16].

Conclusion

NIRS is an analytical technique and is beginning to be applied in sports science. There are problems with measuring oxygen levels for triathletes but if these were resolved, the triathletes would be able to measure oxygen levels in their blood so they know how well their muscles are working.

There are quite a few ways the device could be made; with straps or even as a watch but as the triathletes swim, some small devices integrated into a trisuit are best. The device has been designed to be lightweight, durable, reliable and also waterproof and so should be ideally suited for a triathlete.

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PhD Tutor's comment:

It was a great pleasure to work with E. during the Brilliant Club tutorials on Illuminating the Body. In class he generously shared his ideas and contributed to develop sophisticated discussions. E.'s final assignment particularly impressed me, as the pupil showed an in-depth understanding of the subject, which went far beyond the content covered in the tutorials. He read widely around the topic and creatively manipulated the information to produce his own, original near-infrared spectroscopy system to monitor oxygen levels in athletes' muscles. I am very proud of E.'s progression throughout the programme and there are no doubts he will be an excellent undergraduate.

A machine to measure muscle oxygen levels for athletes

Year 8, Key Stage 3

M. Piperdi, Moor Park High School and Sixth Form, Preston.
Supervised by I. Salako, University of Sheffield.

Mo Farah is the UK's most successful track athlete with ten "world and Olympic gold medals" among many other achievements (BBC Sport). He became the first athlete to win three long distance doubles at successful championships. Born in Somalia, Mo Farah came to the UK at the age of eight. He now lives in Portland, Oregon (USA) with his wife and four children. The journey to his successful career began when his P.E teacher noticed his exceptional running skills. Although Farah never originally wanted to become a track runner, it was what he was good at and what he decided to pursue his career in (Mo Farah official website).

As a professional runner he needs to train hard and to be able to perform at his best, it is important that he knows the oxygen levels in his blood, in order that he can keep the oxygen levels throughout the body in balance. This would allow him to run faster for longer periods of time without getting tired therefore enabling him to win comfortably whilst remaining at the top of the leader board (Mo Farah official website). For this reason, a device to measure oxygen levels in the blood would benefit Mo Farah.

Like all sports, running has its own unique attributes therefore a particular style of device would be needed to measure oxygen levels in the blood specifically for running. The ideas that need to be considered are problems such as being able to measure the oxygen levels without altering his performance. It would be beneficial to consider where the device would be placed on his body and where it would be most effective. For this reason, it would be useful to design a device that would feel comfortable on the athlete whilst measuring oxygen levels effectively and successfully.

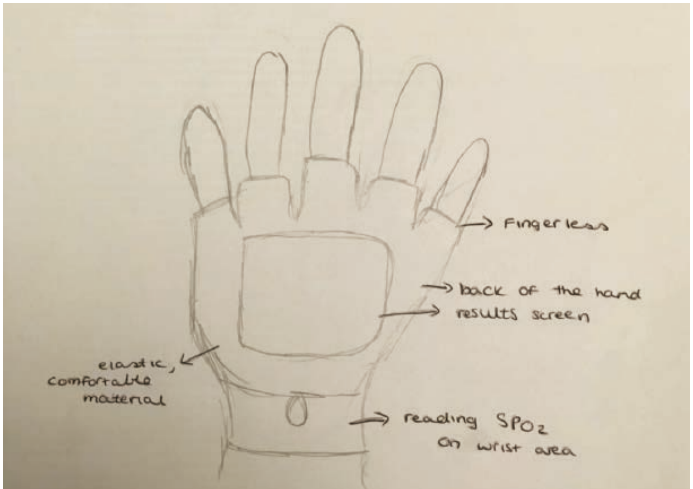
There are many devices currently on the market that are able to measure oxygen levels in the blood. For example, the pulse oximeter measures pulse rate and oxygen saturation in the blood, in order to maintain an effective oxygen range. In the early 1970's the creator, Takuo Aoyagi (a Japanese bioengineer), "recognised that he might be able to use the pulsating changes in the light transmission through the ear to measure arterial oxygen saturation" (Oximetry org.). Using it to monitor oxygen levels can help

make adjustments to get an equalised oxygen flow. It is wireless, lightweight and easy to use. This can drastically improve the performance of an athlete.

Another device that could potentially be used is the standard oxygen monitor which is used in ICU and surgery. This device is good at "detecting low oxygen levels that arise because of low or obstructed blood flow even though the lungs are working just fine" (Stanford news). The inventor, David Benaron, designed this piece of equipment so that it can determine oxygen levels by noninvasively reading the colour of the blood (Stanford news). "Unlike the pulse oximeter, this new monitor can zero in on the amount of oxygen reaching specific areas" (Stanford news). However, because this device is normally placed on the finger it may be impractical for an athlete such as Mo Farah to wear this whilst running as it may fall off.

There is also another device called the humon hex. The humon hex is wearable and is a heart rate dependant device. It uses optical lenses to non-invasively monitor oxygen levels in the muscle. "It was initially designed to be worn on the thigh as the quad is the main muscle that powers running motions", but it can also be worn on the arm (gizmag). This would make the design more practical for wearing whilst running.

Bearing in mind the products that are currently available, I propose to produce and manufacture a new and more effective device called the handy oximeter (shown in the diagram below) as it is worn on the hand as a glove. It also measures oxygen hence the name oximeter. It would be fingerless and fit comfortably on the hand. The material would be thin and stretchy, similar to lycra and not uncomfortable. On the wrist area would be the device reading the (SPO2) from arterial blood gas analysis. On the back of the hand will be a surface for a screen to show the results of the amount of oxygen there is in the blood. The fingers would be uncovered so that they can grip onto things such as a water bottle or cup during a marathon.



To make one of these devices would require a team of specialist engineers and experts who have the skills and expertise to complete the challenging task. A clinical engineer who specialises in a type of biomedical engineering primarily for implementing medical technology to optimise healthcare delivery would be useful for their medical knowledge and technological knowledge to help adjust the device and create it.

Biomedical engineers usually work in a hospital. They could assist with the kind of materials necessary because they would know what would be harmful to the skin and what wouldn't. In addition, mechanical engineers work mainly with machines and could be useful for helping build the product in a more successful way. They would be able to make sure the device would not malfunction or harm your body.

As with other medical devices, there are other challenges that the engineers may face. For example, not all runner's hands are the same size and everyone would need their own suited glove. For this reason, it may become necessary to measure every athlete's hand to size and each glove would be specially made to fit each individual athlete's hand.

Also, the engineers would need to consider that sometimes when the athlete is in training, it is very likely that they are going to sweat and some of the sweat may be on their hands. Therefore, they would need to make sure that the glove is made using waterproof materials which won't be penetrated by sweat and also that any moisture does not allow any important components to slide off or become damaged. In addition to this, the people designing the material would need to be aware of the fact that some materials can damage your skin and some athletes may have allergies to certain materials therefore, they would need to ensure that they speak to individual athletes regarding these requirements.

The engineers who are constructing the product would also need to keep in mind that the components must be small so as not to distract the athlete, and not impede the athlete's performance. However, this may mean that these parts are difficult to work with due to their size. They must also ensure that the screen cover is strong enough to withstand different temperatures since Mo Farah trains in extreme heat but also competes in many countries of the world with varying climates.

As there are challenges for track running, in a similar manner there would also be the possibility of the handy oximeter to be adapted for other sports such as tennis and swimming. This would mean making some alterations to some areas of the design. For example, being a hand-held device, the structure would completely change for tennis because the player would need to hold a tennis racket in their hand whilst playing the game. This would cause many challenges because the handy oximeter could no longer be called handy. Also, the tennis player couldn't even check the device whilst training or playing the game because it would cause a disruption to what they were doing and could distract them. This would mean that the device would have to be situated in a completely different place and one possible solution would be to alter the product so that the most important components fit within the confines of a sweat band around the wrist.

The product would have to be adapted yet again for water-based athletes such as swimmers. In this case, the engineers would need to re-evaluate the materials they would be using because all aspects of the product would have to be waterproof and withstand other things such as water pressure. This may also mean that yet again the product would need to be placed on another area of the body as the hand usually hits the water with force when swimming. A particularly good area for it to be placed would be the thigh as it has strong muscles and there is likely to be less damage to the product.

In conclusion, devices and products that measure oxygen levels in the blood that are currently available can be adapted and re-engineered to suit an athlete such as Mo Farah. I have proposed a new device called the handy oximeter to measure the oxygen levels in Mo Farah's blood which I believe will be reliable and effective. Finally, although alterations would have to be made I think that the handy oximeter would be very useful for many other athletes in very different sports to measure oxygen levels.

PhD Tutor's comment:

M. was a very attentive student in class. Although, she was shy to participate, she endeavoured to make meaningful contributions to discussions in class. Her technical write up about an oxygen measuring device is a particularly excellent piece: it was well researched, very creative (and a build-up on existing ideas), it had logically structured paragraphs and her language style was top-notch.

The climate has always been changing, so humans cannot possibly be responsible for the current climate change. Discuss.

Year 8, Key Stage 3
K. Wilkinson, Hele's School, Plymouth.
Supervised by N. Ellis, University of Exeter.

Introduction

Some people, including some scientists, believe that "the climate has always been changing, so humans cannot possibly be responsible for the current climate change." The climate shows how the atmosphere is changing over a long period of time. It is the average of the weather which is the conditions in the atmosphere over a shorter period of time. The climate is changing over time (figure 1) and there are many reasons for this. For example, Earth has experienced ice ages in the past, such as the Karoo Ice Age 360 – 260 million years ago, where the climate cooled dramatically. Some people consider the climate change to be completely natural whereas others think that it is human induced and what we do every day has an impact on it. In this essay, I will be discussing different factors of climate change and weighing up and comparing both natural affects and human induced affects.

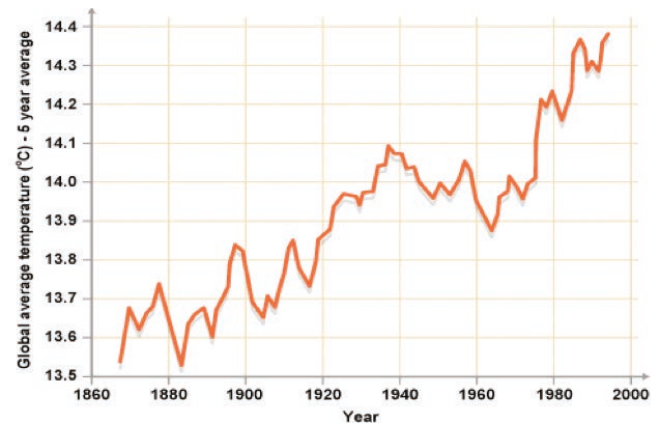


Figure 1 – This graph shows how the average global temperature has risen between 1860 and 2000.

Climate has always been changing naturally

On the one hand, some people agree with the statement "the climate has always been changing, so humans cannot possibly be responsible for the current climate change."

One way to prove this is to study the ocean currents. Due to the continents, the ocean has to travel and channel down to different places. This results in ocean currents. These currents are determined by the density and the temperature and change the speed meaning that the quantity of heat transported to different locations can vary. For example, the oceans absorb twice as much of the sun's radiation as the atmosphere or land surface (Rahmstorf, 1997) meaning that however cold or hot our climate is depends a lot on the oceans.

Another way the climate is changing naturally is the Earth's orbital changes; precession, eccentricity and obliquity (figure 3). Precession is the direction of the Earth's tilt, eccentricity is the shape of the Earth's orbit and obliquity is how much the Earth tilts. Today, we are at the point of precession where we are nearest to the sun in winter and further away during summer. This is constantly changing very small amounts over time. It changes our climate as the position of precession would be expected to cause less severe seasons—and that is what we may be experiencing now as the winters are warmer, and the summers are not markedly hotter (Purdue University,

2014). In a graph from the National Oceanic and Atmospheric Administration (NOAA), the peaks and troughs of temperature matches the peaks and troughs of the amount of solar radiation received in one area (insolation) which changes due to the precession, obliquity and eccentricity. To that end, it is clear to see that the climate is changing partly due to orbital changes.

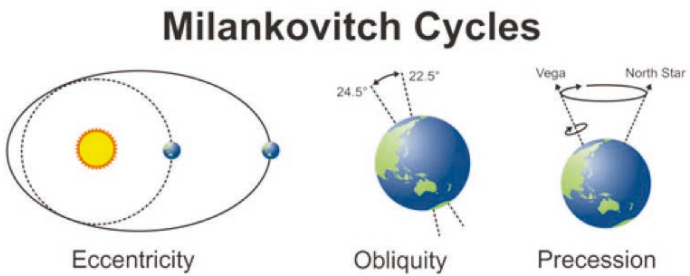


Figure 2 – These pictures show the meanings of the Milankovitch Cycles: Eccentricity, Obliquity and Precession.

Climate can also change due to volcanic eruption. Volcanoes release large quantities of ash and gas when they erupt (figure 4). This blanket of thick chemicals clouds the atmosphere and can block out energy from the sun. Sulphur dioxide is released during these eruptions and the particles formed from this reduce the amount of solar radiation that reaches the Earth's surface causing the climate to cool. The British Geological Survey say that the volcanic dust's effects may warm or cool the Earth's surface, depending on how sunlight interacts with the volcanic material. Just over 200 years ago, April 1815, Mount Tambora in Indonesia erupted. Its ash cloud shot over 20 miles high reaching the stratosphere and quickly spread around the world absorbing sunlight. The average temperature was said to have dropped 3 degrees Celsius which had a big impact on the Northern hemisphere. It led to there being frost in summer and much more rainfall than average which resulted in crop failures. Therefore, it is clear to see that volcanic eruptions can have an impact on climate change whether they are making it warmer or colder.



Figure 3 – This picture shows a Mount Vesuvius releasing gases into air.

On the other hand, some people disagree with the statement which says that "the climate has always been changing" and believe climate change is human induced.

One of the factors causing human induced climate change is deforestation. Trees and plants naturally store carbon dioxide (CO₂) for photosynthesis and when they are cut down (Figure 5), that CO₂ is released into the atmosphere raising the atmospheric levels of this gas. When the sun's energy reaches the Earth's surface, it reflects off it and bounces back into space. However, when there are more greenhouse gases in our atmosphere like CO₂, the heat is trapped in, warming our atmosphere. For example, just tropical deforestation

about 7 trillion tons of water per year into the atmosphere via evaporation (Moutinho & Schwartzman, 2005). This stabilises the atmosphere and helps to keep the climate humid and rainy. If we cut down forests, we are losing that stability as well as emitting carbon dioxide to warm the planet. Therefore, we can see that deforestation contributes to climate change and humans are causing this. This means that our actions can change the climate.



Figure 4 – This picture shows a deforested landscape.

Another factor which supports the topic of human induced climate change is the burning of fossil fuels since the industrial revolution. Since the industrial revolution, we have needed coal, oil and gas to power the machinery invented. Burning these solids emits the two main greenhouse gases, CO₂ and CH₄, into our atmosphere (figure 6).



Figure 5 – This picture shows our factories releasing gases into our atmosphere.

These gases absorb the heat from the sun and re-emit it back towards the earth's surface, resulting in the climate getting warmer. For example, a graph from BBC Bitesize (figure 7) shows how much CO₂ was emitted into the atmosphere between 1700 and 2000. It shows a rapid rise of the amount emitted since 1850 – near the end of the Industrial Revolution. On another graph from the BBC (figure 6), it shows that the temperature rises with the carbon dioxide and the two factors start to do so at the same time. As mentioned previously, this is at the end of the Industrial Revolution where we needed to power electricity and heating, burn fossil fuels at facilities for energy and use fuel for transport. It is said that avoiding dangerous climate change will require a rapid transition away from fossil fuels (Erickson & Lazarus, 2017) as the gases we are releasing are not stabilizing our atmosphere and keeping the correct percentages of each gas where they need to be. To that end, it is easy to see that the burning of fossil fuels such as CO₂ and CH₄ contributes to climate change.



Figure 6 – This graph shows a rise in temperature since 1860.

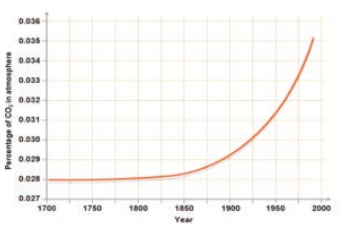


Figure 7 – This graph shows the rise of atmospheric CO₂ since 1700.

Finally, another factor of human induced climate change is the number of Chlorofluorocarbons (CFCs) that we were releasing into the atmosphere. CFCs are chemicals found in spray aerosols, air conditioners and refrigerators. They can change our climate by reacting with gases in our atmosphere. In the lower part of the stratosphere, there is something called the ozone layer. This layer is what absorbs most of the sun's ultraviolet radiation to stop it coming down to the earth's surface where it can harm animals and humans. When these CFCs reach the upper atmosphere and are exposed to ultraviolet rays, they break down into substances that include chlorine then react with the ozone in the ozone layer and begins to break it down. This allows more heat to reach the surface of our earth, warming our planet. It is feared that the ozone layer is deteriorating due to the release of pollution containing the chemicals chlorine and bromine (National Geographic, 2015) which are chemicals found in the human resources listed above. In some places the ozone layer has deteriorated by about 20% (National Geographic, 2015). This acts as a factor of climate change as earth's surface is exposed to more heat and we can see this by comparing the temperature and CFCs emissions. CFCs were banned in 1996 but they still impact us by raising your carbon footprint (Scientific American, A Division of Nature America, 2017) A study shows that during the increasing phase of CFCs, trends in temperature are also increasing (Revadekar & Patil, 2011) and that the conclusion of this study is that the variation in surface air temperature indeed has a certain link with the changes in CFCs (Revadekar & Patil, 2011). Consequently, we can identify that CFCs contribute slightly to climate change.

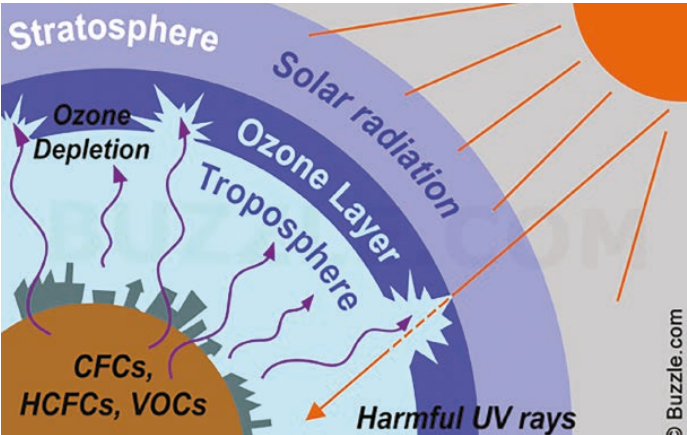


Figure 8 – This picture shows the layers of the atmosphere and ozone depletion.

Conclusion

Many people have different opinions and views on the statement, “the climate has always been changing, so humans cannot possibly be responsible for the current climate change.” Some people agree and believe that climate change is mostly natural whereas others disagree and think that it is mostly human induced. Based on the evidence that I have discussed, in my opinion, I believe that climate change is partly due to natural causes, such as volcanoes, orbital changes and ocean currents, however I think that it is mostly human induced. The most important piece of evidence that reveals this to me is the hockey stick graphs that show how the burning of fossil fuels emit CO₂ and CH₄ into the atmosphere and absorb the suns radiation and re-emit it back towards the earth's surface. For me, the evidence of multiple graphs and statistics show that the temperature is rising with the levels of atmospheric greenhouse gases and the time of the significant rise corresponds to after the industrial revolution when we needed to start burning fossil fuels.

PhD Tutor's comment:
This is a wonderful and original essay by K. from Hele's School in Plymouth. The essay demonstrates a level of thinking beyond that of year 8. She is able to concisely convey and discuss complex arguments about the climate change debate, using examples beyond those discussed within tutorials. She received a well-deserved first for this essay.

Cucumber Triterpene Biosynthesis

Year 9, Key Stage 3

S. Peabody-Critoph, Pakefield School, Lowestoft.
Supervised by H. Griffiths, University of East Anglia.

Abstract

In this report, I will be investigating triterpene biosynthesis in the cucumber, *Cucumis sativus*. Prior to this, no genes involved in triterpene biosynthesis have been identified. I used bioinformatics tools to identify some candidate genes similar to the example OSC provided (atPEN3, which produces Tirucalladienol synthase) and predict their functions, hoping to identify the gene(s) responsible for creating cucurbitane or Cucurbitacin. A phylogenetic tree was made comparing the candidate OSCs with some example OSCs that were previously provided. The tree revealed that two of the candidates were likely to be involved in triterpene biosynthesis, so I outlined how one would go about investigating them in the lab to determine their function. The other candidate OSC was similar to sterol synthases, so it is likely also a sterol and involved in primary metabolism. However, the triterpene cucurbitane we are trying to find is involved in the creation of Cucurbitacin steroids, so it may be worth investigating this candidate as well to determine whether it is involved in the creation or use of the desired triterpene.



Introduction

The species being investigated is *cucumis sativus*. This species, also known as the cucumber, is part of the gourd family, *Cucurbitaceae*, and is related to melons, squash, pumpkin and zucchinis, among many other popular foods. The cucumber produces the triterpene cucurbitane which the many cucurbitacin steroids are derived from, though the specific one in the cucumber is cucurbitacin C. Cucurbitacin is a secondary metabolite (not essential for survival). It acts as a defence mechanism for the plant, deterring herbivores from eating the plant by producing the bitterness that some cucumber fruits have. As much as humans consider this taste undesirable, animals are repulsed by the taste and will not eat the cucumber. Additionally, even low levels of cucurbitacin have been reported to cause food poisoning symptoms such as nausea, cramps and vomiting [1] in humans. Thankfully, most people will spit out cucumbers with high levels of cucurbitacin as they have a very distinctive sour taste.

Interestingly, Cucurbitacin steroids have been found to have antitumor and anticancer properties [2]. Therefore, it may be beneficial to discover the gene(s) involved in its creation. It is already known that the triterpene cucurbitane acts as a skeleton in Cucurbitacin, so the specific target I will try to find is whatever gene is responsible for producing it.

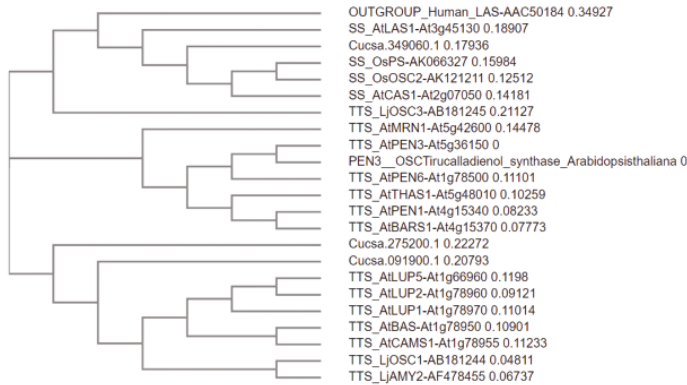
Methods

To find the candidate OSCs that were used for this investigation, I used the Phytozome [2] website. I performed a tBLASTn search.

The query OSC I used was atPEN3 (Tirucalladienol synthase) using the parameters in Appendix 2. I then used the Clustal Omega tool on EMBL-EBI to organize a phylogenetic tree from the three candidate OSCs, atPEN3 and the example OSCs given. The tree can be found below in the Results section.

Results

The three candidate OSCs are all long enough to be actual OSCs and are all very similar in length. The peptide sequences for these OSCs can be found in Appendix 1. The phylogenetic tree below was produced using the method described in the Methods section above. Our first and third candidate OSCs, Cucsa.275200.1 and Cucsa.091900.1 are closest to TTS-atBARS1. I couldn't find information on atBARS1 specifically, but the title TTS suggests it may be a triterpene synthase. This means these candidates could be related to our desired triterpene in this investigation, cucurbitane. Cucsa.349060.1 is next to two SS OSCs, suggesting that it is a sterol synthase. This is the most likely of our candidates to be a true OSC as it is the closest to an actual OSC (SS_OsOSC2-AK121211.0.12512).



Discussion

From the phylogenetic tree results that were found in the section above, I believe that OSC candidates 1 and 3 are most the most likely to be involved in triterpene biosynthesis, as they are next to each other and are found between many TTS (triterpene synthase) genes. The two candidates are also next to AtLUP5, suggesting they are involved in producing Lupeol synthase or something related to it. This is possibly notable, as Lupeol has been found to have antitumor and anticancer properties [5] [6]. As stated before, cucurbitacins have also been demonstrated to have similar properties [2], which suggests a relation between the two chemicals. This could be why the candidate genes are so close to Lupeol. Therefore, I believe that these two genes in particular are worth further investigation to determine if they do produce cucurbitane when expressed.

Candidate 2 should not be completely ignored, despite not being similar to other triterpene synthases such as the other candidates. It is most likely a sterol synthase, which means it may not create cucurbitane, but instead use cucurbitane that has already been produced by other triterpene synthases in the plant to create the final product, Cucurbitacin C, which is a sterol. For this reason, I think all three candidates should be investigated further to find any relation between them and cucurbitane.

Future Work

The candidate OSC(s) that have been found to be of interest will be investigated further. To do this in the laboratory, I would clone the desired gene and insert into a cloning vector, such as the plasmid pBR322 [7] or the cell of another plant such as Nicotiana benthamiana. This particular species of plant is very good for cloning and expressing [8]. By cloning into the plant, it will begin to express the gene and produce the OSC. I would then

extract the metabolites that are produced and analyse them to find out what type of triterpene is produced. This process may be repeated many times with many different candidates as it is unlikely that one would be able to correctly identify the gene that produces the desired triterpene without very intense research.

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Appendix 1
Target type: Genome
Program: tBLASTn
Expect threshold: -1
Comparison Matrix: BLOSUM62

Appendix 2

>Cucsa.275200.1 - Beta-amyrin synthase / 2,3-oxidosqualene beta-amyrin cyclase
MWRRLKLGKEEKEYMFSTNNFVGRQTFWEFDPQAGVAAARQSFYGNRRNHVQCSDDL-
WRFQFLREKNFKQITPKVFVEEGKGNEKVLMDTETKIALRAATFFVALGSDHGHWPAENAGPLYFP-
PLVFALYITRDILKTIFSGEHEKILRYTYNHQNEDEGGWGLHVGESCMCLTVLNYQLRLGEEADKEAC-
FRARKWILDHGTALYIPSWGKIWLAILGVYVEWEGTNPMPEVWWMFGSEKVGVPNGALYCYCRLTFLPM-
SYLYGKRFVGPLTPLLQLRQEITYTQSYTDINWNPAPRHQYCAKEDKCFERPLIKLAWDALQYFGEPLN-
SRAFKVRNRALQINKLHIDYEDHCSRYITIGCVKEPLCMVACWADNPNGEAYKKHVARVDYLVWVG-
EDGMKMQQSFSGSQSWDAFAAGAILATKLHDEFANTLKKGHDFIKKSQIKENPHGDFKRMRYHISKG-
GWTFSDQDHWGQVSDCTSENLCCLITSTMSPEIVGDPMPEQCFYDAVNILSLQAKNGGMAAWEPT-
GTVPSWLEWFFDDEVIVAVVDDEVVMTSNRGDHEKVRCEILVIFICMKYVECTSSAIALVLFKN-
LFPSSHRRKEIENFIENANFIKQTKQEDGSWYGVNWDGICHYATFAIKGLVAAGNTYNNCLEISKA-
VEFLLIQIQCEDGGWGESHISCKKVHTHLPDNASNLVQTSFALMALIHSQQARRDPTPLHRAAKL-
LINSQLEDGDYPQQEAGVADTCMLHYALRYNVPFLWALAEYFNVSIP*

>Cucsa.349060.1 - Cucurbitadienol synthase
MWRRLKVGKESVGEKEEKWIKSINHLGRQVWEFCAENDDDDDEAVIHVVANSSKHLQQQR-
RQSSFENARKQFRNNRFRHKQSSDLFTIYGEKEIARNGAKNGGNTKVKGEDVKKEAVNNTLER-
ALSFYSAIQTSDGNWASDLGGPMFLPLPLVIALYVTVGLVNSLVSKHHRQEMCRYIYNHQNEDEGGW-
GLHIEGSSTMFGSALNYVALRLLEGDANGGECGAMTKARSWILERGGATAITSVGLWLSVLGVYEW-
GNNPLPPEFVLLPYSLPFHPGRMWCHCRMVYLPMSYLYGKRFVGPITHMVLSLRKYLTIPYHEID-
WNRSRNTCAQEDLYYPHPKMQDILWGSYHYVEPLFNGWPGRRRLREKAMKIAMHEHIHYEDENSRY-
ICLGPVKNVNLMLCCWVEDPYSDAFKFHLGRIPDYLWLAEDEGMRMQGYNGSQLWDTAFSIAQLIST-
KLIDTFGSTLRKAHFVKHSIQIEDPCGDPNVWFRHIHKGAWPFSTRDHGWLISDCTAEGKLKASLM-
LSKLPSKIVGEPLEKNRLCDVAVNVLSLQNGEGGFASYELTSGYPWLELINPAETFGDIVDYSVECTSAT-
MEALALFKLHPGHRTKEIDAALAKAENFLNMQRDTGSWYGCWGVCFYAGVFGIGKGLVAAGRTYN-
NCVAIRKACHFLLSKELPGGGWGSEYLSQCNKYNTLEGNRPHLVNTAWVLMALIEAGQGERDPA-
PLHRAARLLINSQLENGDFPQQEIMGVFNKNCMITYAAYRNIFPWLAGEYSHRVLT*

>Cucsa.091900.1 - Isomultiflorenol synthase
MWRRLKVGDDGNDPPIYSMNNFVGRQIWEFDPNAGTPEERVEVERLRQNFINKRHKENSFLSADLL-
WRLQLREKKFKQSIQGEKVEDGEEISYEKASNAMRRGAYFLAAIQAQSDGHWPSETSGPLFYMCP-
MLICIYVMGIMDTILSPEHKEMLRYYIYNHQNEDEGGWGLHVGHSNMFCTTFNYISLRLLEGPE-
VEQLFRSRNRWIRHRGVTSPISWKGKTWLSILNVDFDSSGNPMPPPEYWMMLPTWLPHPHNMCMCY-
TRITYMPMSYLYGKRFQAPLTSFILQLRDELHTQPCQINWKKARHMCAMEDLYFPHPFVQDILLWD-
LYLLTEPLTRWPFNFIRQKALNETMRHIHYEDENSRYITIGCVKEPLCMCLACWIEDPESECVKHLAR-
LPDYFWMAEDGMKVQSGFSQSWDAFAAMEALLSCNITHEIETAINNGHQIKNSQVRNPNPSGDYKSM-
FRYMSKGSWTFSDCDHGWQLSDCTAENLKCCLLLSLPEIVGKKMEPERFYDAVNVLNLQSKNG-
GIPAWEPASSYYWMEWLNPFVEFLDLIDHEHVECTSSSLQAILFRKQYPSHRKEINNFINAKIQLL-
DTQLPDGSGWYNGWIGCYTGTWFWALKALSMAGKAYENCEALRKANFLINIQNSEGGFSGESYLSCAT-
KRYPLDGKRSNLVGTAWGLMLGLICAGGA

PhD Tutor's comment:

I was thoroughly impressed with S.'s final assignment. We covered lots of ground in the field of plant triterpene biosynthesis throughout the course and S. demonstrated a deep understanding of this complex material by not only completing a bioinformatics analysis on his chosen plant species, but linking his results to available literature for this species. Amazing. I am confident S. will achieve great things at University and beyond.

Arts and Humanities

What do representations of nature in Blake's *The Tyger* and Wordsworth's *Upon Westminster Bridge* tell us about ourselves and how writers use nature in literature?

Year 5, Key Stage 2

HT. Harris, Barons Court Primary School, London.
Supervised by L. Salud Gadella Kamstra, University of Essex.

To answer this question I will be looking at how Wordsworth and Blake use nature in their poems. In particular, I will look at how they use the metrical features of rhyme and rhythm, and figurative features such as metaphor, personification and simile.

Meter refers to the rhythm of a piece, for a complete discussion of the different types of rhythm see the glossary of poetic terms supplied by The Poetry Foundation [1]. The meter of both poems are very similar because they use pairs of stressed and unstressed syllables but are different because the stress is on the first syllable in *The Tyger*, this is called trochaic meter, and the stress is on the second syllable in *Westminster Bridge* which is called iambic rhythm. A poem's rhyme scheme is about how often the final syllable of each line rhymes with other final syllables. Literary Devices [2] describes many different rhyme schemes. *The Tyger* uses a very straightforward scheme of rhyming couplets and *Westminster Bridge* has a more complex scheme known as a Petrarchian sonnet.

Blake's use of a fairly simple rhyme scheme and regular trochaic rhythm helps to create a sense of threat and danger which is what we associate with predators like tigers. This is because the trochaic rhythm is similar to rapid heart beats and the simple rhymes remind me of a rap song. In contrast, the iambic rhythm and more complex sonnet rhyme scheme of Wordsworth's *Westminster Bridge* is calmer and more peaceful and is more like a ballad.

Blake's *The Tyger* includes lots of different types of figurative expressions. He uses synecdoche, or taking the part for the whole, e.g. 'What immortal hand or eye' and 'what shoulder' to suggest that there is a creative being who made the tiger. He alludes to, or suggests a link to a well known story about God and Lucifer, e.g. 'on what wings did he aspire' and 'did he who made the lamb make thee?' There is an extended personification when he says 'when the stars threw down their spears and watered heaven with their tears,' which might also allude to the story of angels and God in heaven. Finally, there are many metaphors for the colouring and movement of the tiger, e.g. 'Burning bright', 'burning eyes' and the extended metaphor of the tiger's creator as a sort of blacksmith in the fourth stanza. These figurative forms are nearly always combined with questions which engage the readers attention and makes us think. The poem focuses on nature as if it was scary and negative but also beautiful and impressive, for Blake *The Tyger* might represent nature as awful, in the sense of filling us with awe.

Blake uses simple language which is easy to understand. For example, 'burning bright,' 'forests of the night' which are simple visual metaphors for The Tyger's colouring and habitat. However, his nature images also indicate divinity and supernatural power, for example, 'in what

distant deeps or skies' to suggest either God or something demonic making *the Tyger*. Blake encourages us to think of alternatives by asking lots of questions. We can see this in 'did he who made the Lamb make thee?' which suggests the Lamb of God, i.e. Jesus. This is in stark contrast to the terrifying power of *the Tyger* and raises the possibility that *the Tyger* might represent Lucifer. This would connect to the image of aspiring on wings to seize the fire in the second verse that sounds a lot like the story of the fallen angel.

Wordsworth does not use as much figurative language as Blake but he substitutes that with his complex rhyme scheme. You can see his figurative language when he talks about 'This City now doth like a garment wear,' this is an obvious simile and personification which makes the city seem more natural. Wordsworth uses personifications to help us identify with natural features in the view, e.g. 'the river glideth at his own sweet will', 'never did the sun more beautifully steep in his first splendour', 'the very houses seem asleep' and 'all that mighty heart is lying still'. Personifications like these play a big part in the figurative language Wordsworth is using to help us understand how he feels about nature and the city. There is an extended metaphor of the relationship between the city and its broader natural setting for example 'Ships, towers, domes, theatres and temples lie Open unto the fields and the sky'. This makes it seem as though the city is being held by nature, or that the natural world is nurturing and supporting the beauty of the city.

Wordsworth's use of this language can be thought of as subversive since I expected Wordsworth to describe London as dirty, crowded and unpleasant. However, Wordsworth chose his words carefully, suggesting that he knew his reader would expect London to appear nasty and he deliberately went against this. You can see this clearly in his saying 'dull would he be of soul who could pass by' because he is attempting to persuade us that London is majestic. In other words, he had assumed that his reader needed to be persuaded that London could be beautiful. There is another place where we can see him thinking about his reader's expectations later in the poem where he describes the air as smokeless. This suggests that Wordsworth knew his readers would be thinking of how much fuel got burned in the homes and factories of the city.

In these poems there is a contrast between the complexity and simplicity of the rhyme and rhythm and the richness of the figurative language used. It is as though the more complex the structure the less rich the language and vice versa. For both poets there is a balance between these which can relate to nature, e.g. the desert which has lots of sun but little biodiversity, when compared to a flooded and wet rainforest which is much more diverse because the heat is counterbalanced by the moisture. For me, having both complexity and richness would be more like Manley Hopkins's *Spring* which might appeal to other readers, but I find it excessive.

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PhD Tutor's comment:

It was an absolute joy to work with T. during The Brilliant Club tutorials. I was particularly impressed with his level of sophisticated thinking and in-depth understanding of the complexity of the issues we studied. He was awarded a 1st for this work and mainly, for his exceptional explanation about the authors' techniques in the literary texts analysed.

How is nature depicted in English literature?

Year 5, Key Stage 2

T. Sajeeth, Maidenhall Primary School, Luton.
Supervised by I. Rets, The Open University.

In this essay, I am going to write about: how does nature make us feel about ourselves; how is it depicted in literature and what techniques can a writer use to describe nature? The power of nature is strong enough to make people and authors believe different things. The usage of nature varies in religious scriptures which makes people's beliefs vary. Nature uses the weather and the seasons to make us feel a pile of emotions, like summer makes people happy, but the wind can cause natural disasters that are petrifying but in a way it is proving the strength of the earth. It is always reminding us about how humans are not in control of the world and in particularly nature. Nature can be used to match or create any type of genre or atmosphere. Sometimes, it can be gentle to creation or violent depending on man's work in the world. Nature also gives creation (human, animals, plants etc.) their basic needs, such as streams which carry pure water. The story of Genesis states: 'let the water bring abundantly.' So, God had already placed nature in the earth for us to take and he also made nature for us to admire it and also receive spiritual and physical guidance as well as benefits, though sadly, most humans take nature for granted and are harassing it. Nature is also heaven's reflection on earth and anyone trying to disturb the natural order is considered evil. Nature is a really powerful tool which is used by writers to give emotions to the readers. My opinion is that nature is beyond the human mind which means it is capable of making humans feel different and those feelings differ due to the different views of nature by various people.

Nature is a base and inspiration for literature which allows it to create different moods amongst people and in various literary pieces and forms of art. Romanticism poets like William Blake and Gerard Manely Hopkins showed a whole new viewpoint on beauty of nature rather than man-made objects in his poem. The mood that a writer tries to create is all down to the aspect of nature in their piece. Nature is capable of creating a scene of violence or tranquility, so when authors, dramatists or even poets use nature they create moods using different aspects of nature. The beauty of nature has been used over the years by different authors and writers, to create effect. To replicate a mood of exhilaration, clouds or things found in utopia (paradise) are used but for a piece of violence or death, hurricanes and things in dystopia (the end of the world) stand out in their literary pieces.

The beauty of nature makes people think various thoughts and opinions. Nature is always strong enough to tempt humans due to God's will. Peace is created when there are trees or flowers and insects are mentioned. The poem *Spring* by Gerard Manely Hopkins mentions 'the glassy pear tree,' and the poet is describing nature as calm and it is creating a mood with no sense of danger. The poet William Wordsworth in his poem *Upon Westminster Bridge*, describes the early morning nature through the line '*the river glideth at his own sweet will*', but once it gets busy; this will be disrupted by human activities. Whereas, in the Greek myth of *Persephone and Hades* the text states: 'every autumn, when Persephone returns to the underworld, Demeter ignores the crops and lets them die.' This gives the unpleasant atmosphere of the autumn. It also explains Hades' sin, which caused the loss of summer all year round. Though nature can be good or bad, sometimes a poet can change the mood using just nature as every bad aspect has a better meaning deep inside. When that piece is derived from the original form, the true meaning of the role of nature in that piece is uncovered.

Due to the variety of genres for literature, the meaning of nature can be depicted in lots of different ways. Nature is used to set the tone and the mood of a piece of literature. Through analysis we can understand nature as the foundation of many pieces of literature. Only the through the description of nature in that poem, will the poet be able to 'build' the rest of the poems mood, tone and atmosphere. Depending on the way the writer admires the nature is the way that nature will be used in their text. For example, William Wordsworth describes the nature of the city as being 'a calm so deep' as that is how he admires the nature of the city. Nature can also be used and described in a menacing way, as said by William Blake. His poem '*The Tyger*' he says the nature of the tiger as being a 'fearful symmetry' and so, depicting nature in a spooky way. To describe nature, writers use a range of adjectives and a countless amount of natural events and things as they can describe nature more than anything else. Commonly, writers use personification to give natural objects human characteristics which help the poet to describe nature even more. Metaphors are also used to compare nature to another thing, giving the mood. Nature is used to make the language of the poem fit a particular background and it is capable of producing a deep interpretation of nature.



Statue of Persephone, Goddess of the underworld, springtime, flowers and vegetation

A writer or poet of any piece of literature uses a number of techniques to influence the reader and make the readers get into their piece. Lots of these techniques include personification anthropomorphism (giving human aspects to animals as the Ancient Greek fabulist Aesop did) and using descriptive language as that is very strong at depicting nature. As nature is a vast concept, it is very difficult and time-consuming to describe it all at one go, so by using these techniques nature can be described much faster and more efficiently. Sometimes similes, metaphors and idioms are used to compare one thing to another which is helpful when describing nature. We know that nature is unpredictable, so it can be good as well as bad and by using these techniques, writers can match their writings with nature. This means that nature can really take over literature, but most of the time they seem to work well with each other (nature and human) in harmony.

My opinion is that nature always has a dynamic presence and can always fit within the borders of literature. I also think that humans have a purpose here on earth and nature provides all our basic needs such as water (humans are 66% water), oxygen (20.5% of the air) and food which are all essential for humans and animals and all other creations to survive. Nature can be good and bad; humans have the right to choose their path. The importance of nature to humans is that it provides the sustenance and essentials for life, so we need to take care of it and not to pollute the environment which so often leads to humans having to face the anger of nature. Nature is a great gift from God to the humans on earth.

PhD Tutor's comment:

T. did a great job with the essay. He has a great potential to writing and the kind of advanced vocabulary he already uses in his writing is impressive. I liked the fact that he used references to the literary pieces we discussed in class and at the same time he gave his own critical evaluation of them. Wishing T. best of luck in his future studies!

What is Fairness?

Year 6, Key Stage 2

S. Arnold, St Mary's Catholic Primary School, London.
Supervised by T. Ogunye, London School of Economics.

A dictionary definition of fairness is the quality of treating people equally or in a way that is right or reasonable. Treating people the same regardless of their gender, ethnic background, religion, sexuality, disability or age is a legal requirement. The Equality Act 2010 is an act of parliament which protects people from discrimination in the workplace and elsewhere. Apart from it being illegal to discriminate people, I think it is right to treat people in a fair manner. If you treat people equally without discrimination, you hope that people will treat you in the same manner back. In an ideal world everyone would be treated equally, which would lead to everyone being happy, this is called egalitarianism. But we don't live in that kind of world, we live in a world where I believe many individuals and countries strive to have more than their neighbour.

We see people being treated unfairly – with inequality in different areas of our lives. Some children being favoured by teachers, parents with pushchairs or cyclists not being allowed onto busy buses. Recently it came to light that female journalists working for the BBC were being paid less than their male workmates. This was despite doing the same job.

Sometimes treating people differently is the right thing to do. Elderly people living in the UK get given £200 per year towards the cost of heating their home. This is because older people are more likely to get ill from living in cold conditions. They need more help and protection than other groups of people.

Maybe fairness is about everyone getting what they need. In developed countries more people live above the poverty line which means that they have shelter (a home) and food. In other parts of the world a greater percentage of their people live below this standard. In the UK, living in poverty is defined as 'relative poverty' where a person can't afford an 'ordinary living pattern – they are excluded from activities and opportunities that an average person enjoys.' Those living in poverty need more, so get benefits to enable them to live more comfortable lives, whilst those who earn more money, pay more tax. This is how social justice works in the UK, the rich pay a high percentage to help the poor. Those in need are provided for by those who have more.

Another way of looking at fairness is that we get what we deserve, from how hard we work. So, a business leader like Sir Alan Sugar, who has worked hard and invested his time and money into his company, deserves his success and his wealth. Why should he share what he has earned with those who have perhaps worked less hard? If a student studies hard, they deserve to get a good exam result. This way of looking at fairness centres on the individual rather than society. Not everyone sees inequality as a bad thing; in a speech in January 2014, Mayor of London Boris Johnson, claimed that inequality was useful- it rewarded the most able and encouraged wealth creation.

None of us choose which country we are born in, but where you live can affect the kind of life you will have. We can't look at fairness in just what happens in our country as countries affect each other in terms of trade. An example of this is bananas, which are the fourth most important crop and are grown in many countries. The life of banana plantation workers is hard with some workers earning about £1 a day, which is not enough for them and their families to survive on. When UK supermarkets were competing to lower prices on bananas, this would have affected the price the small producers got. In 2008 one in four bananas sold in the UK was fair trade. Fair trade ensures that the small producers

get a fair price for their produce. In turn, workers get better working conditions and a better wage; 'in Columbia farmers saw an increase of 34% to their income.' What if they UK government and other governments took the decision to only allow fair trade products to be sold? Hopefully this would change the lives of the workers and farmers in these countries. It must be assured that CEOs of large producers were not getting huge salaries and that all the elements of the supply chain such as distribution costs were reasonable. When people live in poverty, they may have poor housing and not enough food or heating and it must feel difficult to change their lives. I have seen the fundraising programme Comic Relief where they show children who can't get an education because they must work or care for their families. Without education it must be even harder to get a job to earn good money and have a better life. Peter Singer argues that well-off people have a moral obligation to donate money to save the lives of some of the world's poorest people if they can do this without sacrificing anything very significant. I am lucky that I can help others by giving money without it affecting my life. It would be harder to give my food to someone else who is hungry if I didn't know when I would next get fed. Depending on your own situation, it can be harder to show fairness to others before thinking of your own needs. John Rawls looked at this is his 'Veil of Ignorance' theory, where he asked us to think about fairness, without knowing what our own situation is. For example, it could be fair for everyone to live in a two-bedroom house, those who are homeless or living in smaller homes, would see this as a positive thing. Those who live in bigger homes would see it as negative. If we had to be fair without knowing the impact on our own lives, it would be much harder, in fact almost impossible to do.

In conclusion, I believe fairness means that everyone should get what they need and have the same chance as others to get what they deserve. At the start of this essay I would have argued that everyone should get the same, however, I have come to realise that fairness is about equal opportunity. I think we have a duty as individuals to make the right choices, such as buying Fair trade, sharing what we have with others and to see fairness from other people's perspectives.

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- 9 http://www.bbc.co.uk/ethics/charity/duty_1.shtml
- 10 <https://www.futurelearn.com/courses/introducing-humanism/1/steps/298783>

PhD Tutor's comment:

It was a joy to tutor S. and the other children at St Mary's Catholic Primary School. I was hugely impressed by how confidently and creatively they approached the final assignment – fairness is not an easy topic to understand and discuss! S.'s essay, in particular, was excellent – clearly written, well structured, and packed full of independent researched. He should be very proud of what he has achieved.

How nature is used in literature and what does it tells us about ourselves?

Year 6, Key Stage 2

C. Blomfield, Milton Hall Primary School and Nursery,
Southend-On-Sea. Supervised by L. Salud Gadella Kamstra,
University of Essex.

In this essay I will be talking about how authors use nature in literature in both story and poem to express their ideas and opinions by using different techniques. Furthermore, I will discuss how we relate to nature as humans. Firstly, nature is all around us, but often we do not notice it, as we are too wrapped up in our own urban lives. We fail to give the appreciation that is owed to the beauty of the natural environment around us. However, when we start to think about going on holiday, we seek out nature such as woodland, meadows, or perhaps a jungle using the internet and brochures. Thrill seekers may seek out exciting natural places such as cliffs, mountains and all sorts of death-defying climates, for the fun of climbing, hiking, sky diving etc. Some humans enjoy the adrenaline rush in these natural environments, while others may choose the calm and peacefulness of camping or the beach. In literature the author presents us with the scene without leaving our normal lives, as does a brochure or internet review, where we can make our own choices and choose what pleasures us.

Firstly, we must look at why in general a setting is important to a story. The positives of having a setting as that they tell us the time and place, therefore, sparking the imagination and helping us visualise the scene. It stirs our emotions and helps us to relate to the story and characters. Let us first start with the two creation stories, one Biblical [1] and the other from Greek mythology [2]. In both of these stories the earth is described as an idyllic setting, a utopia, with the Garden of Eden and a land of eternal summer. I think that they both sound like wonderful places to live, but unrealistic. They symbolise nature in its most perfect and pure form and as humans we all strive to be perfect in some way. In spite of both worlds' initial utopia the struggles of life begin due to the greed and want of humans or gods disobeying the rules. The authors show that there are always consequences for not making the right choices. We see this in Adam and Eve as they are cast out from God's Garden of Eden and in 'Persephone' eternal summer no longer reigns. This reinforces the idea that rules should be obeyed to keep the world in harmony.

As we see in William Wordsworth's poem he uses nature to subvert our views of a city, therefore the setting is vitally important [3]. When you first picture a city in your head, you might think of rushing people with some where to go, people going to work, and generally a bustling, crowded and smoggy city. However, in Wordsworth's poem he describes the city at the break of dawn and exaggerates the beauty in the image before him by saying 'Earth has nothing to show more fair', meaning that this is an even greater sight than Mother Nature's natural beauty. He refers to the sight as 'touching in its majesty', which makes one think of grand splendour and bliss, that it would take your breath away. His choice of metaphor is interesting as he describes the sun dressing the city 'like a garment, wear' in a glittering golden haze, following up his theme of 'majestic'. He is removing you from the idea that the city is a network of human activity and waste and introducing you to a different perspective of emotion, romance, tranquillity and contentment. He is conjuring up images of great beauty and makes you want to have the experience of seeing this for yourself. Most of us like to look at beautiful sights and enjoy the feeling of contentment therefore it is very appealing. Wordsworth uses nature to connect to our emotion of love and feeling of pleasure.

In contrast, *Blake's The Tyger* [4] uses night to intimidate, as dark epitomises evil [5]. The forest of the night draws you into a scary and dark setting. Additionally, he keeps referencing fire i.e. burning, burnt, furnace, sometimes in relation to the Tiger's colour and symmetry, but also to reflect on the emotion of anger, such as 'burnt the fire of thine eyes?' Blake's poem might appeal to those that like danger and the wild, whereas for others it might be too fear-filled for their taste. Blake implies that the Tiger is the perfect, ferocious, silent predator. Subsequently in this poem Blake makes us question or challenge God's state of mind at the time he put this creation on earth. For those that do not believe in God, they may instead question evolution; how has something so stunning, sleek and magnificent evolved to be so powerful, deadly and fearful?

In the story of the *Egyptian Princess* a lot of descriptive reference is given to the River Nile [6]. The Nile was simply vital for the Egyptians to live and without it their civilisation would fail to survive. Without this backdrop, the reader would not understand how life revolved around the Nile. It is logical to conclude that life in the Egyptian era depended on the River Nile almost alone from reading this story. The story would not have the same historical value and quench the reader's thirst for knowledge if they are interested in this period of time.

However, in *Skulduggery Pleasant* the Cave of Voids is a made-up scene and the only historical value is that in the past caves have been associated with witches, spirits, and magic [7]. The reader already brings their own basic knowledge and imagery, while the book adapts it further to comply with its plot. It is described likewise to a labyrinth of tunnels with secret caverns, hiding nature's worst unknown monsters. They are lurking, waiting, watching in the dark. It is crucial in providing fear, excitement, suspense and anticipation. All of these emotions one would associate with a thriller.

To summarise, authors use nature in both a positive and sometimes intense way in their work to express their ideas and views. They appeal to our primal emotions, survival, fear, love and hate [8]. They challenge our perceptions in some cases and can turn our general view upside down and inside-out to make us re think more in-depth, or from a different angle. We may prefer certain authors due to their vivid imagery and style of writing such as romantic, thriller, fantasy or comedy. This is our own choice dependant on our mood or personality type. Literature without a setting would be more like a script from a play, but when performed a play relies on the scenery around the stage to set the scene. My conclusion is that the setting in literature is just as important as the characters and the plot as it creates a complete 3D experience in your imagination.

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- [6] Vince Cross – My Story Egyptian Princess
- [7] Derek Landy – Skulduggery Pleasant
- [8] <https://www.quora.com/What-are-the-basic-instincts-of-humans>

PhD Tutor's comment:

C. is a very keen student and I thoroughly enjoyed her mature viewpoints in class. Her essay is unique in providing her opinion about the authors' intentions in their texts. As a Year 4 student, she received a 1st for this work, which means she is already performing to an excellent standard at Year 7/8!

What Representations of Nature Tell Us About Ourselves and How Writers Use Nature in Literature

Year 6, Key Stage 2

J. Hunt, Ormesby Village Junior School, Great Yarmouth.
Supervised by D. Watmough-Triggs, University of East Anglia.

In this essay I will be writing about what nature tells us about how we feel, how nature is used by different writers for different effects and why a writer would choose a certain technique. I have chosen to use Spring by G.M Hopkins and *The Day of the Triffids* by John Wyndham for examples and will be considering the different possible interpretations.

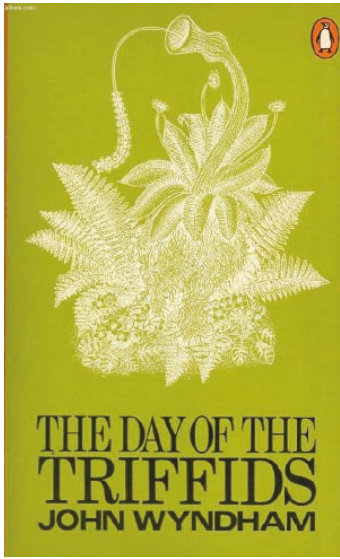
An author can choose their language to create a certain type of scene, for example, if an author wanted to create a happy scene there could be sunshine and flowers whereas if there was upset and anger, there could be thunder and lightning. If you were alone, you could maybe hear birds chirping and the sounds of crickets. The author can create feelings by using nature to describe people's feelings or a scene. I will look at how G.M Hopkins and John Wyndham have used different types of language to set the scene.

The two texts I have chosen to look at have many contrasts in the way that they describe nature. In the poem Spring, the author Gerard Manley Hopkins makes me feel happy by putting positive words in the poem such as beautiful, joy, winning and lovely. When he says, 'a strain of the Earths sweet being in the beginning in Eden Garden', this makes me think spring is only a small part of the world's beauty. The author has described spring as utopia (an imagined place or state of things where everything is perfect). It makes me think we should be celebrating the joy of new life, 'thrush's eggs', 'glassy peartree leaves and blooms', 'racing lambs' and 'girl and boy'. He has used nature to create a pleasant atmosphere, even describing weeds (a plant that is unwanted) in a positive way when he says, 'when weeds in wheels shoot long lovely and lush'. He makes us feel lucky and that we can experience spring as, 'nothing is so beautiful as spring.'

In *The Day of the Triffids* it talks about the world being taken over and how things are taking over the use of man, for example things were growing everywhere; in the seats of abandoned cars, in the roof guttering and in the cracks of the pavement. He describes it as 'on all sides they were encroaching to repossess themselves of the arid spaces that man had created.' He uses nature in a way that makes me feel the weeds are alive and have power; the plants are taking back what was once theirs. He describes 'grass and weeds had a hold in the gutters and were choking the drains.' John Wyndham describes weeds in a negative way, whereas Gerard Manely Hopkins describes weeds positively, 'when weeds in wheels, shoot long lovely and lush.' *The Day of the Triffids* by John Wyndham is an example of dystopia (a place that is imagined and is undesirable), whereas Spring by G.M Hopkins is an example of utopia (an imaginary place where everything is perfect). This poem has many contrasts between the poem Spring by G.M Hopkins as the former has language that makes me feel distressed and worried whereas the latter uses language making me feel calm and happy.

I think that the authors have created two different effects by using opposite words to each other to describe an uneasy feeling. Both of the poems use nature to create a certain type of atmosphere but in two different ways. The authors do this, for example, Wyndham states, 'leaves had blocked downspoutings', whereas Hopkins uses language such as, 'the glassy peartree leaves and blooms.' This means each

text is completely different by describing leaves in a very different way to create different scenes. Each text gives me completely opposite feelings as Spring by G.M Hopkins makes me feel calm and happy, whereas *The Day of the Triffids* by John Wyndham makes me feel powerless and scared.



I think the authors that I have written about are very clever because they have chosen their verbs very well. If they had not chosen such powerful verbs, it would not have brought the text to life. In Spring by G.M Hopkins he has used personification such as, 'echoing timber does so rinse and wring the ear, it strikes like lightning to hear him sing' to describe how wonderful it is to hear the thrush sing. This is showing us that G.M Hopkins has described spring as an amazing time of the year. He also used metaphors in a clever way for example, 'thrush's eggs look like little low heavens' which makes me feel as if the eggs are only just hatching, an exciting new life. Using the word 'heaven' makes it even more special, making me think of paradise and God. I get opposite feelings when I read *The Day Of The Triffids* by John Wyndham as it tells me what hell would be like, for example 'as it passed beyond the scope of any magic wand, most of the ghosts were going with it, withdrawing slowly into history.' This tells me that this is the end and there is nothing we can do about it, not even a 'magic wand' could fix it. Another example of a metaphor is 'the blue is all in a rush with richness' this gives me the idea that the blue sky is filled with deep colour and in a rush to come for spring.

The author John Wyndham has used personification to describe the plants taking over the world such as when he says, 'the gardens of the parks and squares were wildernesses creeping out across the bordering streets.' By using 'creeping out' he has created an uneasy feeling and has made me feel as if the wildernesses do not want me to know they are creeping out, as if they were human. Metaphors have also been used by John Wyndham, such as, 'almost every building was beginning to wear a green wig' which makes me feel like the buildings have been deserted and left for dead and to rot. I can imagine a building overgrown with weeds and ivy far more easily because John Wyndham has used 'green wig' to describe it. He has also used 'springing from cracks in concrete' by using the word 'springing' this means it is all happening rapidly.

In conclusion, I have shown how writers choose to write about nature in different ways to create different effects and how this makes us feel. I have used Spring by G.M Hopkins and *The Day of The Triffids* by John Wyndham as examples in order to demonstrate my points.

PhD Tutor's comment:

I loved tutoring at Ormesby Village School. All the children were a pleasure and were always ready to contribute – I was impressed by the way J. held his own as the only boy in the group! J.'s essay shows huge maturity, both in style and critical thinking. He engaged with the texts we studied in a thoughtful and intelligent way and demonstrated a great ability to develop independent arguments. J. was an asset to the group, and I am sure he will continue to develop and find his voice in new and exciting ways as he moves onwards through education.

What is fairness?

Year 6, Key Stage 2

J. Smith, Warren Primary School, Essex.
Supervised by Y. Twumasi-Ankrah, University College London.

What is fairness? Is it having equality for everyone? Is it something that we earn by making the right choices and being kind to others? Is it a right that we all have to feel happy, that we belong, that are feelings are important? Oxford Living Dictionaries describes 'fair' as meaning 'treating people equally without favouritism or discrimination'. (1) I will be looking at possible meanings of fairness and what fairness means for different people. I will be asking how we can decide what is fair and what is not, also whether different situations change what is seen to be fair.

Fairness could mean sharing; how often do you hear young children say, 'it's not fair?' Whenever a child isn't getting what they want they declare that they are being treated unfairly. To them fairness may well just be the difference between what makes them happy and what makes them sad. To the adult sorting out the problem it is probably more about conflict resolution and taking turns or sharing out the toys. When you move onto school, schools have strict rules and if the rules are followed by everyone then everyone gets treated the same, therefore fairly. This continues into adulthood where you have the law enforced by the police. The police are taught that 'if the public don't have the confidence to trust the police to be fair, acting ethically and in their best interests, they are less likely to assist the police in upholding the law.'(2) This would suggest that people need to feel that we are all being treated the same in order to be valued and happy.

In the UK we have the Equality Act 2010, which is intended to 'protect people from discrimination, harassment and/or victimisation' (3). This act suggests that all people should be entitled to be treated fairly, to have equality regardless of their age, gender, disability, race, class or ethnicity, but the big problem is how do we help everyone in the world?

Let's start with people who have disabilities, for example deafness. Deaf pupils are entitled to additional time in their SATs because of the differences in the way they sit the test and receive the information than their hearing friends. Other children may see this as unfair because they find it hard to finish in time too. Should both groups of children be treated the same or is it fairer to make an exception for the deaf child, giving them an equal chance at achieving their best? My school Equality Duty and Objectives policy states that we 'ensure that everything the school does must be fair, non-discriminatory and not put individuals or groups of people at a disadvantage.'(4)

People in wheelchairs have limited access to parks, beaches and shops. They often have difficulty finding suitable employment. The little things that able-bodied people take for granted, disabled people often find more difficult. The government help by offering benefits, but maybe they don't want to rely on benefits when most people have the choice to earn their own money and feel valued for the job that they do. Unison, the public services union found that, 'over one and a half million of disabled people live in relative poverty because of low benefit levels and lack of access to suitable jobs.' (5) Many public places offer disabled parking and discounts to make life easier for a disabled person, to some people these privileges may seem unfair. A disabled person shouldn't pay full price if they can only access part of a place and they shouldn't struggle to walk a long way just because we all want the closest parking spaces.

Then there is the problem of fairness between genders. Many people have argued that there are discrepancies between men and women's pay and how easy it is to climb the career ladder in some jobs. For example, recently there was a big argument at the BBC because women claimed they were paid less than men, yet they were doing the same job. A TV

news presenter claimed, 'for nearly three years I had been sitting next to a man doing an identical job who was being paid tens of thousands more than me.' (6) That isn't the only example of differences in pay, the NHS was found to 'have a gender gap of 15% with male doctors earning £67,788 in basic pay compared to £57,569 female doctors received.' (7) How can this be fair? In football more people watch men's football than women's football, does this mean that men are better than women or is it simply unfair and women are undervalued?

People of different races and ethnicities have had the same problem. In the UK, most highly paid jobs are taken by White British people and the lower paid, less desirable jobs are often filled by people of other ethnicities. In 2016, 74% of white people were employed compared to 64% of people from other ethnic groups. (8) In order to make things fair, all people should be given a chance earn more and live to a better standard.

If we look beyond the UK to how plantation workers are treated in the banana industry, we see how some people have high wages whilst others live in poverty. Fairtrade has been introduced to try and improve wages and the standard of living for these plantation workers. The banana industry is worth £580 million per year (9) however, The Independent (29/17) reported that 'for bananas costing £1 the labourer gets 3p' that means the worker only gets 3% of the profit, yet they are doing all the hard work and causing damage to their health, as it has been reported that 'rashes and wounds are common from cutting of the branches – sprays are dangerous.' (10) The CEO of Chiquita Bananas gets £360,800 per year,(11) and the money could be more fairly shared out. Higher wages given though Fairtrade have been proven to improve people's lives, with 75% of workers in Ecuador having better food health and 66% having better education for their children. (12)

In my introduction I wanted to find out the meaning of fairness, but maybe there isn't only one answer. As John Rawls explored in his experiment 'The Veil of Ignorance', maybe fairness is just what we all agree on at the time or maybe fairness should be like the rules at school; unchangeable.

I conclude that fairness can change depending on who you are and how you see things as an individual. What a person may feel is fair is often based on what they would like to happen rather than what they need for a good and happy standard of living. From a very young age children will have an opinion about what they feel is fair for them. As we grow into adults, in order to be fair we need to consider everyone's needs not just our own, as I have pointed out through discussing Fairtrade, equality, disability and gender issues.

Unfortunately, fairness is hard to achieve for all people, but with the help of the Equality Act, Fairtrade and people thinking about the needs of others, individuals may feel fairly treated even when they are less fortunate than others. Maybe fairness is as simple as attempting to treat everyone the same and giving everyone the same opportunities.

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PhD Tutor's comment:

J.'s essay was a joy to read, well-written and insightful, he added lots of information from outside the course which really showed his level of knowledge and understanding. He received a grade of 70 which reflected the level of work put into the essay. J. engaged well with the course and grew in confidence throughout the sessions. As he moves into secondary school, he does so with new skills and should be proud of his achievements.

Discuss what representations of nature tell us about ourselves and also how writers use nature in literature

Year 6, Key Stage 2

P. Tanoh, St Antony's Primary School, London.

Supervised by F. Schulze–Feldmann, School of Advanced Study, University of London.

Nature through literature is proven to have different characteristics. Different writers use certain strategies to depict nature as calm as well as powerful compared to urban life. Authors use nature in their pieces for different effects on the reader's emotions. The texts that I will be focusing on are: *Spring* by Gerard Manley Hopkins, *Tyger* by William Blake, *Day of Triffids* by Wyndham and *Persephone* on Greek Mythology. Nature influences how we might feel and act through different writing techniques, such as pathetic fallacy. The setting is part of nature which enables the writers to establish the scenario of their stories. With the setting, readers can visualise the nature in a story. Nature and setting seem to have a relationship as they both introduce the scenario.

First and foremost, the poem *Spring* opens a door in the reader's mind with vivid imagery. The reader can see a wonderful garden with frolicking lambs and flourishing flowers. With these descriptions, the reader perceives the sense that they are in their own garden, and nature surrounds them. The passage suggests that they are in the Garden of Eden, or another place with the same level of sacred beauty, as the writer refers to the scene as the 'Eden Garden'. Towards the end of the poem, the reader focuses more on the real Garden of Eden, and the incident with Adam and Eve. The way nature is described here shows Gerard Hopkins can change the effect his writing has on us as we read the text just by the kind of imagery he evokes. It represents the cause of how we lost that beautiful place to a trivial thing such as sin. Nature is depicted as tranquil. Gerard Hopkins uses romanticism, admiration for nature, to show the beauty almost making the setting perfect. It also includes some Christian aspects as it relates to the Garden of Eden. Also, it represents more a prayer than a poem, recognising God's dominion.

The poem *Tyger* symbolises the fierce force of the human soul. The *Tyger* is a highly symbolic poem based on William Blake's personal philosophy of spiritual and intellectual revolution by individuals. Blake is puzzled at the sight of a tiger in the night and starts questioning its ferocious appearance and who the creator of the majestic beast is. This text can relate to romanticism; as Blake is in such a state of awe because of the tiger, he creates a wonderstruck feeling with the use of continuous rhetorical questioning. The tiger was created in the imagination of the god who has supreme spirituality and ideals. The anvil, chain, hammer, furnace and fire are parts of the imaginative artist's potent means of creation. The creator has energy and skills. His creation is strong and almost daunting, so it must be the man's spirit and imagination, or the poet's. The forest is the symbol of a corrupted social convention. The speaker in this poem has begun to recognise the suppressed power of his soul. Thus, nature is represented as powerful and tells us about the way we treat each other as human beings.

Furthermore, writers can depict nature as dangerous, demeaning, and unpredictable. For example: *Day of the Triffids* by Wyndham compared to other texts can be outlined as negative. Nature's role in this passage is to create havoc and chaos throughout the concrete jungle. The fact that nature is defeating all forms of urban life

shows its strength. This extract relates to dystopian fiction, which was a very popular style of writing during the twentieth century. Dystopia is an imaginary community or society that is undesirable and adverse. Overall, *Day of the Triffids* demonstrates that nature is strong and fierce as a supernatural force. It shows us that we underestimate nature and dystopia shows us its strength.

The texts *Tyger* and *Day of Triffids* focus vividly on the injustices of the societies that they both include. *Tyger's* point of convergence is the destruction of a community by politics. The negativity of the city is represented by the tiger; a strong animal in nature. *Day of the Triffids* shows the destruction of the city by the fierceness of nature. *Persephone* also relates to Dystopia as it includes the underworld, also an unwanted place to stay. Hence, nature is represented as a strong force in some parts of literature, showing that nature is not only composed but potent and tough. It also shows that we treat politics as stronger than nature, however, they are both as strong as each other.

Aesop's *The Town Mouse and the Country Mouse* and William Shakespeare's *As You Like It* both represent nature as serene and tranquil. Aesop, the fabulist, showcases nature to be much calmer than the city. He compares the city to the country and portrays the message that the country is a much calmer place with fewer dangers. A part of the story states, 'better beans and bacon in peace than cake and ale in fear' showing nature can be a safe atmosphere because, although it may be less exciting than city life, it can be deeply comforting to be in such tranquillity. Shakespeare, on the other hand, goes directly to the point. He immediately criticises the urban life as perilous and envious. A phrase from the passage denotes negativity '... Are not these woods more free from peril than the envious court?' showing that nature is a tranquil, peaceful, and unperturbed. Therefore, nature, through literature, can be illustrated as mostly a positive, calm and relaxing. This tells us that we find nature a beautiful and great place to relax when going through a rough time. It is a place to let worries go away.

Nature throughout literature is depicted with different characteristics that showcase our emotions as human beings. To achieve this effect, different writers use different techniques to show possible interpretations. Dystopian fiction shows nature to be strong and aggressive showing the way feel towards the world. Nature is a creative and controlling power which is thought of as an immediate cause of its marvels. Writers use pathetic fallacy to connect human emotions and feelings to nature like how the crops died when Demeter was sad in the story of *Persephone*. I think that nature is a wonder- filled subject and is great to explore, as it tells us a lot about ourselves.

References

- 1 Gerard Manley Hopkins, *Spring*, in course handbook, page 30
- 2 Tutorial 5, *Dystopia*, in course handbook, page 32
- 3 Aesop, *the town mouse and the country mouse*, in course handbook, page 24
- 4 Shakespeare, *As you like it*, in course handbook, page 25
- 5 *Persephone and Greek Mythology*, in course handbook, page 21

PhD Tutor's comment:

When reading P.'s assignment for the first time, I was astonished by its outstanding quality. P. presents the different modes of how nature is represented in English literature in an engaging and comprehensive manner, showing both a deep understanding of different intellectual and artistic movements and an exemplary rigour in analysing the literary texts. It was great to see her enjoy writing this essay and do so well in what at the beginning seemed a daunting task to her.

Why Was There A French Revolution?

Year 8, Key Stage 3

H. Marshall, The Blyth Academy, Northumberland.
Supervised by J. Locke, Newcastle University.

In this essay, I will explain what drove the common people of France to revolt, overthrow and ultimately kill their monarchy. I will also state which explanations I think are irrefutably the most accurate and give evidence. In my opinion, the best fitting reasons are the intellectual explanation (where it is explained as a clash of ideas) and the cultural explanation (where it is because of changes to normal peoples lives). I am going to tell you why I think these two are equally valid explanations for the French Revolution and how they link to one another. Also in this essay, I will write about why the Marxist theory (where the revolution is explained by class) is counterfactual when applied to the French Revolution.



Firstly, I think that the French Revolution began because of the rise in the use of logic over tradition that began in the age of reason (1600s–1700s), when philosophers started to create new ideas about the world. In 18th century France the power was shared evenly between 3 groups (estates) called the estates general: 1st estate consisted of the clergy; the 2nd estate was the nobles and royalty and the 3rd estate was everyone else. However, this system wasn't even at all because the 3rd estate made up 98% of the population and only had one third of all the power. Even then, in reality, they had no real power because the king had absolute power; therefore logically the estates general was against the 3rd estate's best interests. This uneven power scale enraged the commoners but their higher class counterparts didn't care because they were blind to the struggles of the victims and by the privileges they gained from the unfair power system. The corruption and discrimination came into practice when the commoners were heavily taxed, paying half their income to the 1st and 2nd estates; whereas the nobles, who were supposed to pay taxes, and the clergy were excluded from the taxes. Even in the time of mass hunger among the commoners (the late 1780s) due to repeated crop failures, the taxes were not relaxed to give the commoners some respite and the higher estates did not help the most hard working estate out of starvation much at all. This fired up the commoners even more and they wrote in their cashier (letter of complaints to the estates general) that they wanted to have equal status in order to solve the problem of exploitation through taxes. They wrote, "his subjects of the third estate [should be] equal by such status to all other citizens... without distinctions"[1]. I think these lines are very important because later the national assembly, formed by the 3rd estate, said very similar words in their social contract, which is one of the main enlightenment ideas, the Declaration of the Rights of Man. They wrote "men are born

and remain free in equal rights"[2], which shows how much of the Revolution began directly because they were being subjected to inequality and they realised that logically they'd be better off with a more even power structure, rather than relying on the traditions of being ruled by a king and living in the estates general structure. That's another one of the main enlightenment ideas, and so the revolution must have started because of the new enlightenment ideas; hence one explanation for the French Revolution is the intellectual explanation.

In addition, I think that the cultural explanation fittingly explains the French Revolution because it so strongly links to the intellectual explanation. At the time of the beginning of the Revolution, the proportion of people from the third estate able to read was notably increasing. Evidence of this is that in Montmartre, 74% of men and 64% of women could sign their names; and in a fashionable street in St Honore, where one third of residence were from the third estate, the literacy rates were at 93%. This means that the literacy rate was higher in eighteenth-century France than late twentieth-century America [3].This evidence, when combined with philosophers' enlightenment idea books, means that intellectual ideas were being spread by books. One of these philosophers from the time was Jacques Rousseau and his view was that people should rule themselves as a sovereign power system (where the general will of the people was expressed through laws that everyone follows on equal footings). His ideas spread and became the principles for the French Revolution because people saw there was a better system, which they fought for. Evidence for that is in the Rights of Man. It says "the law is the expression of the general will. All citizens have the right to take part, in person or by their representatives must be the same for everyone" [3]. This is almost the exact thing Rousseau wrote, which leads to the conclusion that the common people were reading more, and reading an intellectual philosopher's book and agreeing with it. Thus the Revolution began because of the intellectual event of the enlightenment ideas and the cultural event of the 3rd estate reading more.

Perhaps Rousseau gained his opinions from his childhood in Geneva, Switzerland. There the power system was as corrupt as France; the allegedly democratic government was based on the male "citizens" voting and the "inhabitants"(residing Genevan immigrants) having no suffrage and considerably fewer rights. The number of residents who were qualified as citizens became proportionately smaller and they were constituted a minority [4]. Eventually, a council of 25 ran the city in usurpation with full control, like a monarchy, which could explain his anti-monarchy beliefs.

However, the opposing view - the Marxist view- is that the French Revolution was started because of the class struggles of the higher and lower estates over power. Marxist historians believe that, because the commoners didn't have as many rights as the 2nd and 1st estate, they gained a class consciousness (realisation that they could end the exploitation) and began the French Revolution, a theoretically classic Marxist event. However, "historians have shown that the more literate an area was ,the more it was likely to criticise the king and nobles"[5]; or in other words, gain what could look like a class consciousness in the eyes of a Marxist historian, but is in fact commoners reading more and learning new intellectual ideas from the philosophical books. The 3rd estate reading more is a cultural event and the enlightenment ideas are a big part of the intellectual explanation, so the French Revolution did not begin because of class and ergo is not a Marxist event.

Lastly, I think that the Revolution began because of the de-sacralisation (becoming less-sacred) of the king and monarchy. This came about partly because of the new enlightenment ways of looking at the world (the core of the intellectual explanation). But I think that an equal part of it was the behaviour of king Louis XVI. The king was seen

as lackadaisical towards governing and the 3rd estate's needs, despite France having an absolute monarchy (a monarchy where the king has all the power). This is because he discredited the monarchy supporting the American Revolution and almost bringing France to bankruptcy. As well as that, the commoners thought he and his wife were selfish, terrible leaders who spent lots of money on frivolous things (like expensive clothes and food), whilst letting the poor starve and adding to France's bankruptcy. To make matters worse, in 1789 he asked the estates general to meet so he could propose tax increases in the midst of severe food shortages and starvation. This was the first time the body had met since 1614 but Louis would not let all three estates meet simultaneously so the Third Estate proclaimed itself a national assembly, declaring that only it had the right to represent the nation [6]. Propaganda was soon spread by the 3rd estate suggesting that he was under the thumb of Queen Marie Antoinette and inadequate to rule. Evidence of this is the picture of the 2 headed monster which says "the two make one". It was drawn shortly after the two tried to flee the country and King Louis is depicted as a goat ,which is a traditionally stupid animal, and the Queen is seen as a cheetah, which is a symbol of slyness. The picture shows that the commoners thought they were sly and stupid, therefore bad rulers. Marie Antoinette was often depicted as horrid things like this harpy. In Roman and Greek mythology, the harpy was a bird-woman cross and means "snatcher"[7]. In stories they stole people's food; this is significant because Marie Antoinette spent France's money, which could have been spent on food for the starving. People saw her spending lots of money as taking the food from the poor. She was hated for that, along with her husband, which meant they weren't respected and so were rebelled against.

I conclude that the French revolution started because of both intellectual and cultural reasons and not Marxist reasons. I have explained in the above paragraphs that I think parts of the cultural and intellectual explanations capture the reasons behind what interminably altered the very structure of French power. I think that, after extensive research, the French revolution was caused by the 3rd estate reading more (a cultural event), therefore having more access to philosophical reading matter about enlightenment ideas against the King and France's estates general. Those new ideas spreading around gave the commoners, who already felt anger towards the King, inspiration to rally against the monarchy and obtain equality for all.

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PhD Tutor's comment:

H. has produced an excellent essay. She has put forward some compelling explanations for the reasons why there was a French Revolution and has supported her arguments thoroughly throughout through the use of sources. There is a great analytical approach to these sources which shows a clear understanding by H. of the material delivered by her tutor. Although the arguments throughout were well balanced, it was also impressive to read H.'s conclusion, as she presents her own beliefs in a very intellectual and unique way. She clearly has a deep understanding of the historical context and has captured the many of the reasons for the altering of the structure of French power. Well done H.!

Why was there a French Revolution?

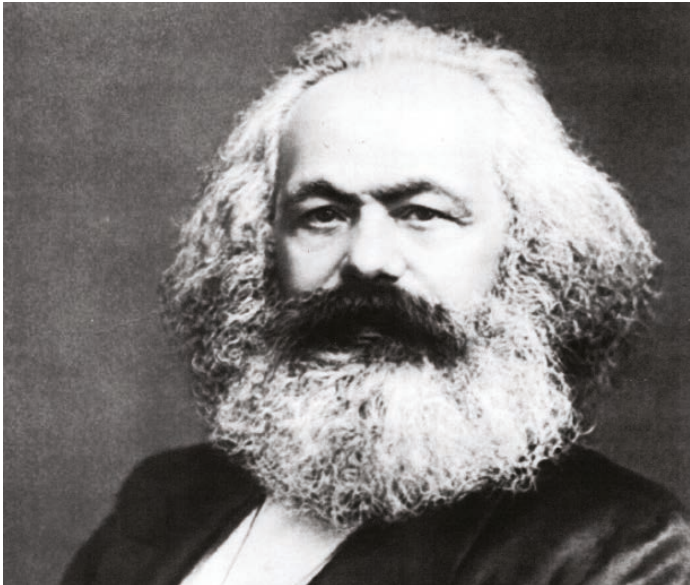
Year 8, Key Stage 2

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Supervised by J. Locke, Newcastle University.

In this essay I will discuss the three main theories about why the French Revolution happened: the Marxist, Intellectual and Cultural explanations. I will review the importance of these ideas and show how they each explain the revolution. I will argue that all three opinions are valid interpretations and they all are correct. They all put forward different ideas about how and why the French Revolution started and are supported by many sources.

The French Revolution itself officially began in 1789 and ended 10 years after in 1799. In 1789 around 98% of the population were peasants. Their lives were hard, and they had to pay taxes to their lords and the church. France was also bankrupt as it had spent too much money on wars. What made the peasants angrier was that in the Estates General (which was made up of clergy, nobility and commoners) they only had one vote even though they made up most of the population. Because of this they decided to form their own National Assembly and refused to disband until France had a new constitution. Meanwhile the food crisis was worsening and there were many riots due to the worsening social problems. Finally, on July 14th the Bastille (a French prison) was stormed and weapons were stolen. In August the National Assembly made changes to improve peasant's lives and declared that all men 'are born and remain free and equal in rights'. They tried to power share with the king, but he refused and tried to leave the country. Revolutionaries then arrested and executed him in January 1793 and Queen Marie Antoinette nine months later. Maximilien Robespierre now led the French Revolution and made it even more extreme arresting 300,000 people with at least 17,000 being killed from 1793-1794. He was eventually overthrown and executed in 1794. Napoleon Bonaparte, a young army general became increasingly powerful and eventually became the new Consul of France. He effectively had the same powers as Louis XVI, thus ending the French Revolution.

The first interpretation is Marxism. This was created by Karl Marx (1818-1883) who established a set of ideas that explained how history ran. He believed that people are divided into classes. These classes are split between those who must work for a living and those who live off them. Therefore, history progresses when one or more of these groups tries to overthrow the other in what Marx called a 'class struggle'. This can only happen if the whole class realises that they are being exploited by the more powerful classes and wants to change this. The key word here is 'whole' because what is called a 'class consciousness' works only if everyone in that class strives to make a change. Marxists (historians who believe in Marx's theory) accept that the French Revolution was a typical class struggle. This was because of the three main groups in French politics: the clergy, nobility and commoners. Firstly, the French King Louis XVI had complete power over how France was run. He could make new laws and raise taxes as high as he wished. However, due to the revolution he, the nobles and the clergy lost more and more power. This meant he (and they) had less control over the laws and taxes. This is supported by tracking the bread prices in Paris from August 1788-December 1789. The price (in sous) of bread rose from 9 sous in August 1788 to 14½ sous March 1789. Then prices dip down and fall dramatically to 12 sous after the fall of the Bastille. This shows that because the upper classes had less power the bread prices could be lowered to be made more affordable for the average French labourer who earned around 15 sous per day.



Karl Marx

The second interpretation is Intellectualism. Francois Furet was an important historian who believed that the cause of the French revolution was Intellectualism. Intellectuals believed it was a struggle of ideas. Some could argue that Furet already had grievances with Marxist views before coming up with his ideas, as he fell out with the French Communist Party in 1956 (the Marxist idea of classes suggested that the last stage would be where there were no classes, and everyone worked together. This was Communism). However, I believe that all the arguments are relevant because they all are shown in historical sources. One of the main principles of Intellectualism was that countries should develop a social contract. This was a set of rules based on the natural rights of human beings. This transferred from the feudal system of only one or a couple of people ruling over the masses to democracy where everyone had a say.

There were two main philosophers who envisaged these ideas and those were: Montesquieu (1689-1755) and Jean-Jacques Rousseau (1712-1778). Montesquieu believed that government should be where the power was split between different groups. This was like the system set up before (The Estates General) only fairer. It also stopped one group from becoming too powerful and taking over. This is supported by a cahier (list of complaints) to King Louis XVI, which says: 'That all three orders meet to debate in common concerning the needs of the state;' [2]. This shows that French people agreed with this idea and wanted it to be accomplished. Therefore, this means that this set of intellectual ideas could have worked. However, I disagree with this as I believe that more direct action should have been taken and that because of his unfair treatment of the peasants Louis XVI should have been ousted from the throne. Furthermore, Louis XVI was seen to be untrustworthy and incapable of coming to an agreement unless he still had absolute power as he tried to run away on June 20th, 1791.

Rousseau's ideas were still Intellectual but entirely different to those of Montesquieu. He believed that people should rule themselves by being sovereign (self-governing) over themselves. The general will of the people should be expressed through laws. This would consequently mean that no king or queen could rule. This was a direct challenge to throne and something that many revolutionaries agreed with. Evidence to support this idea is in the Declaration of the Rights of Man and Citizen, which states: 'The law is the expression of the general will. All citizens have the right to take part, in person or by their representatives, in forming this. It must be the same for everyone.' [3]. This clearly states the idea of 'general will'. Furthermore, this was the main set of laws that was demanded by the people so would be followed by everyone after the French Revolution. Therefore, in my opinion, this is the best Intellectual reason as it caused

the French royal family to be abolished and the French people to rule themselves in freedom and democracy.

The final interpretation is Culturalism which was supported by Roger Chartier (born 1945), a famous French historian who believed that the reason the French Revolution happened was purely cultural. This meant that it was motivated by changes to ordinary people's lives that occurred over a long period of time. The king only stayed in power as he was always seen as a divine or holy figure, commanding awe and respect from his subjects. This tactic worked and at his coronation the Duc de Croy wrote in his diary: 'I am sure that I have never experienced such enthusiasm. I was completely astonished to find myself in tears and to see everyone else in the same condition.' [4] In my opinion, this shows that only by making his subjects believe in his utter divinity could the king hope to remain in power. This supports the cultural explanation because in the eighteenth century, his behaviour (and that of others before him over a long period of time) made people revere him less. This is called de-sacralisation. In addition, this also links to the other two aspects of the cultural explanation, the first of which is people's expectations. People's lives started to get better as they grew more intelligent. One of the reasons this transpired was because Catholic schools started to promote literacy for the commoners. Because of this the Third Estate read about and discussed more political ideas. This led to them being more critical of the king and angered by French society as they expected it to change with them. However, this didn't happen and over a long period of time their anger increased. Eventually, when the food crisis of 1787-1788 struck it pushed their anger over the edge.

In conclusion, I believe that all the explanations are true, and they were all part of why the French Revolution came to be. I believe this because there is sufficient evidence to support each case and furthermore, they all support each other. For example, the Marxist explanation states that because of the revolution the nobles and clergy lost a lot of power. This is supported by the cost of bread, which falls, after the fall of the Bastille, to a more affordable price for the French labourer. However, because the French people were fighting against feudalism and for a more democratic society this supports the Intellectual view. (This being supported by the Declaration of the Rights of Man and Citizen and a cahier to Louis XVI). Nevertheless, the French people could only have realised these values and that their society was unfair because they had become more intelligent and literate. This supports the Intellectual view. Finally, the revolution would never have worked if only a few people had realised these ideas which links back to Marx's theory on 'class consciousness'-that is when a class realises its situation and strives to change it. So overall, all three ideas are true and are all causes of the French Revolution.

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- [1] Brilliant Club Handbook, Source 4, Page 19 (originally taken from Dylan Rees, France in Revolution: 1774-1815 (Hodder Education 2008))
- [2] Brilliant Club Handbook, Source 8, Page 23 (originally taken from the Declaration of the Rights of Man and Citizen, 26th August 1789)
- [3] Brilliant Club Handbook, Source 9, Page 23 (originally taken from a cahier to King Louis XVI in 1789 from the Third Estate of Dourdon)
- [4] French Political Thought at the Accession of Louis XVI by Keith Michael Baker

PhD Tutor's comment:

This is a very impressive piece of work, with a sophisticated writing style and clear structure. W. has clearly researched the different causes of the French Revolution and has set these out in a well-balanced and articulate way. W.'s use of key terminologies, theories and explanations exemplify how well they engaged with the material delivered to them during tutorials. This is a great read, conveying a deep understanding of the historical context, a sharp analytical approach to sources and an impressive ability to develop unique arguments. Well done W.!

A Feminist Analysis of Bluebeard

Year 8, Key Stage 3

L. Jones, Ysgol Abersychan, Pontypool.
Supervised by E. Jones, Cardiff University.

Feminist literary analysis looks at issues of gender inequality and the ways men and women are represented in literature. The way these issues are represented in Bluebeard make it a very interesting and unusual story. At first, the story seems to be a typical fairy tale that ends with a 'happy every after wedding' but this story actually begins after the fairy tale wedding and soon the wealthy, handsome lord is revealed as a serial wife murderer. Is the story meant simply to entertain us or make us question established gender roles and the dangers of inequality?

This story has many conventional features of the fairy tale genre. The story starts with 'once upon a time' and has 'a happy ever after' ending, just like in *Cinderella* or *Snow White*. Bluebeard 'is the owner of estates, farms and a great, splendid castle' (line 1, p.50) similar to *Beauty and the Beast* or *Sleeping Beauty*. The story has a handsome lord and a beautiful princess as in *Cinderella* and *Snow White*. The story has a trial in the form of the forbidden secret room, which reminds us of the spinning wheel in *Sleeping Beauty*.

The story has conventional male and female roles. Bluebeard is handsome, powerful, charming, domineering and older. He is called 'Sire' and does not allow his wife to go into the secret room or he will 'go into such a terrible rage that it is better that you don't' (line 25, p.50). The wife is 'young, pretty and noble' (line 7, p.50), as all Bluebeard's former wives. We never learn the wife's name, which suggests she is not important. Her sister, Anna, believes she is 'lucky marrying a lord like Bluebeard' (line 15, p.50). The brothers are also brave soldiers – 'a dragoon and a musketeer' (line 30, p.51).

We also find traditional gender division in terms of power in the story. Bluebeard has many several former wives so we know he is older, wealthier and physically stronger than his young bride. He gives the orders and his wife obeys him – 'nobody at all is allowed to enter the little room' (line 24, p.50). He can test his wife's obedience e.g. the key, he threatens her with consequences (as above) and can punish her if she breaks the rules.

His wife is afraid of him and promises to obey – 'I'll do as you say' (line 27, p.50). However, we find interesting, unconventional gender representation in this tale. Bluebeard firstly appears to be the 'handsome and charming' hero but is actually a serial killer. The wife courageously disobeys her husband by entering the secret room. It is also curious that the wife is rescued by her brothers, not her new Prince Charming such as in *Cinderella* and *Snow White*.

Bluebeard's description is not detailed. He has a 'long, shabby black beard with glints of blue in it' (line 3, p.50), suggesting grey from age. However, the illustration accompanying the text represents Bluebeard as a Turkish prince rather than a French lord, who would be a white Christian. Why is this? Maybe the publisher feared offending the readers (probably white) by portraying a white, European, French Christian as an evil, woman hating murderer, so portrayed him as a Muslim with a drawn sword. This is racist and could mean the publisher thought the story was challenging male privileges in some way. The main plot and action in this story is Bluebeard's test of his wife's obedience by 'handing his wife a bunch of keys' (line, 20, p.50). Is this test an acceptable thing for a husband to do? Why does Bluebeard make his wife curious about the room and give her the key but forbid her to enter? It is like the forbidden fruit in the story of Adam and Eve, as though Bluebeard is God, and the wife is Eve. So it appears Bluebeard is trying to prove a woman cannot control herself and may cause ruin (like Eve) so needs a man to control her and stop her getting into danger. It seems like a game until she 'opens the door' and discovers Bluebeard's horrible crime (line 32. p.50). The test is a cruel game. It seems he wants her

to realise what his actual personality is like but only when it is too late. She is prey and she has been taken in by a predator. But does the author want us to think that Bluebeard is just a psychopathic killer or that he is just an extreme example of all men?

The blood on the key is mysterious and blood has many associations. Why is the little key 'stained with blood'? (line 39, p.50) Whose blood? Why would the blood not wash off the key? Why does Bluebeard know what the blood means? Are we meant to believe it is a magic key and Bluebeard, with his glittering beard, is an evil wizard. The blood reveals that the wife has disobeyed Bluebeard's rule and suggests her punishment (probably death). But what is the crime? Is it simply for being disobedient? How do we interpret the blood? We associate blood with crime, guilt, danger and death. On the other hand, a woman who produces a blood stain reminds us that women menstruate, so blood can also mean the special power to give birth and life. Also, a menstruating woman in some cultures is regarded as unclean and forbidden from certain places by men. So is her actual crime disobeying her insane husband or simply being a woman? Is Bluebeard and men like him motivated to murder of women by fear and even envy?

What can feminist analysis reveal about the meaning of the secret room? Why are the wives displayed 'hanging on the walls' (line 33, p.50) like a hunter's trophies? It appears they also failed the test. Does he secretly visit the room to relive the excitement of murdering them? Are they on display to prove that women cannot be trusted? It appears he wanted his wife to see them so that he could enjoy her fright. When he returned, 'Bluebeard did not ask his wife for the keys' (line 43, p.50) because he knew she would enter the room. He appears to enjoy watching her terror and it gives him an excuse to kill her like his former wives. Bluebeard seems like an accurate description of a psychopathic serial killer from a modern news story or horror movie. It reminds us that controlling husbands and partners are the main cause of female death in the home.

The wife's rescue is both conventional and unconventional. She is rescued by males (her brothers) rather than by her sister or by herself because men are supposed to be strong and brave and women are weak and cowardly. However, she is not rescued by her Prince Charming so he never proves he is brave, just a 'good, honest young man'. But how can she know this for sure if she has 'completely lost her sense of curiosity' (lines 34/35, p.51). Is this a good thing? If she is not curious she cannot find out his actual personality. She has not learned that appearances can be deceptive or that gender inequality can lead to abuse and even murder. The 'poor wives were given a Christian burial' (line 32, p.51), so perhaps she believes that only non-Christian men could murder their wives, but we know this is not true.

In conclusion, this feminist analysis of *Bluebeard* is very useful because it shows that this and similar fairy tales often supports gender inequality and gender stereotypes. However, feminist analysis also reveals that Bluebeard surprisingly make us question whether these gender stereotypes and inequality is a good thing. The story reminds us that there is no link between being handsome and good, or ugly and evil. Bluebeard is handsome and evil. The fairy tale marriage is revealed as a domestic violence nightmare. The story discourages men from behaving in any way like Bluebeard (the name Bluebeard became a popular label for an abuser of females). It may warn women to be aware of the danger of secret abuse in marriage. It may offer clues about the male psychological causes of gender inequality in society and domestic violence and murder in the home. Bluebeard's punishment for disobedience in the home is extreme, but the privilege to rule the home is similar to traditional ideas about men and women even in white Christian cultures up to recent times. The accompanying illustrations give the impression that domestic violence and murder of wives/ partners only occurs in non-white, non-Christian countries, when we know it

is common in all cultures. Therefore, Bluebeard seems to be a strange kind of fairy tale. It makes us question the truth behind what may seem a fairy tale marriage and it makes us aware of the effects of fairy tales and popular stories to make young women want a fairy tale marriage.

PhD Tutor's comment:

It was a joy to have L. in tutorials, where she demonstrated a mature attitude towards her work and made insightful contributions to group discussions. L.'s final essay was a real pleasure to read. It is written with confidence and flair and demonstrates her fantastic knowledge and understanding of both feminist theory and how this can be applied to Bluebeard. L. planned her essay carefully, and undertook a lot of independent research, which made her work original and outstanding. L. is a talented, hardworking, and modest pupil who I am sure will do extremely well in the future. She thoroughly deserves her first-class mark, and I am very proud to see her work recognised in The Scholar.

A Feminist Analysis of Little Red Riding Hood and the Wolf

Year 8, Key Stage 3

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Supervised by K. McCulloch, University of Essex.

Feminism is concerned with the oppression of women and the belief that both men and women should be equal. In this essay I will be looking at the feminist literary theory and the stereotypical way that men and women are portrayed in literature. Are they portrayed in their stereotypical format or are both genders deemed as being equal? In order to do this, I am evaluating *little Red Riding Hood and the Wolf* by Roald Dahl.

The wolf is a fascinating mixture of traditional, and expected, male characteristics and unexpected female characteristics. The wolf is first described as having a 'horrid grin' (1). Horrid is defining the wolf as a definitely evil character as expected. There is a natural assumption that the male character of a story will be the baddie. We believe this because men are generally seen as being the superior gender as they are often bigger, stronger and happier to use violence to achieve their goal. Gentle, weaker, loving, sympathising characteristics will generally belong to the female role. From this we can see that men are seen to have more ability and are happier to act in an evil way than women are. But the wolf mixes these positions up and just a few lines later, 'and Wolfie wailed' (1). The word wailed connotes to the words, weep, cry and sob which are seen as female traits. *The Oxford English Dictionary* has the definition of wailing as 'to make a prolonged high-pitched sound' and the high-pitched implies a female voice, which could be linked to weakness not a male villain attribute (2).

We can see the wolf being tough and having no issue with the concept of killing and eating a child for his own pleasure; 'he sat there watching her and smiled. He thought, I'm going to eat this child.'(1) We would not expect a female wolf to be smiling at the idea of eating a child for her own benefit as we would assume that she would have a motherly instinct to protect children. But then the author choses to give the wolf the pet name Wolfie. With the name Wolfie, the villain can no longer be taken seriously. This makes the wolf appear weak and not intimidating or the slightest bit ferocious. By just slightly changing the wolf's name, Dahl has entirely distorted the reader's viewpoint. He has taken the reader from seeing the wolf as a typical tough masculine figure to a cute puppy that you may want to pet.

The wolf causes the story to become even more entertaining by using imagery to make the wolf appear ludicrous and laughable. The wolf curled his hair in an attempt to make himself take on the appearance of Grandma. As a result of this any claim of power by the wolf has decreased further.

The character and appearance of Grandma entirely adheres to the stereotype of an elderly female. She comes across as needing help and protection, probably given by a man. Therefore, she does not help the feminist literary theory that men and women should be seen as equal.

By applying feminist literary theory to the character of the wolf you can see not only the scary male villain but also the female traits hidden within the character. There are implications that the wolf's decidedly female traits may have made him a weaker character than if he had been totally masculine, therefore resulting in his death. Readers of this poem could draw the conclusion that having feminine traits make them inferior to the more powerful males who are more likely to achieve their plans.

Roald Dahl is challenging the stereotypical view of a fairy-tale heroine. A typical heroine is beautiful, innocent and also wants to please others. In the beginning Little Red Riding hood adheres to this assumption; 'in came the little girl in red' (1). The words 'little girl' make us expect an innocent, cute child (1). The way she is dressed implies that she has a good childhood and has been brought up well. But then the author changes this entirely and frustrates the tradition by writing about this little girl not only having a gun but storing it in her knickers! 'She whips a pistol from her knickers,' is a real twist in the tale that is slightly rude but also rather funny (1)! We consider gun owners as much more likely to be male than female. Therefore Little Red Riding Hood is challenging the assumed social viewpoint.

To start with Little Red Riding Hood is dressed how she is in the original telling of the story in a red hood. A traditional heroine would be dressed similarly, all floaty, impractical dresses and generally feminine outfits. These outfits are often found to be impractical on the adventures that they end up embarking on.

We would assume from the way that Little Red Riding Hood is dressed that she comes from a well off family who care about her and teach her what is right and have traditional values. We would not expect someone, especially a young female, from that upbringing to be in possession of a gun.



Little Red Riding Hood. Illustrated by Quentin Blake

After Little Red Riding Hood kills the wolf she makes a coat out of its skin. She then replaces her inappropriate, childish cloak with the wolf skin coat. Even the author thinks that her original cloak is ridiculous stating, 'no silly hood upon her head' (1). She decides to swap to the wolf skin coat to show off her courage and as a trophy of her victory. 'But what a change!' this quote shows that not only Little Red Riding Hood's clothing has altered but her attitude has also changed (1). The exclamation mark at the end of the line shows that the change is definite and should be noticed. Little Red Riding Hood has become more confident because when she is spoken to she replies with a bright and bold 'Hello' (1) and also makes a point of showing off her 'lovely furry wolf skin coat'(1). By showing off her clothes Little Red Riding Hood is not only adhering to the traditional feminine trait of being concerned about her clothing, but also is being slightly manly by using the wolf skin coat as a badge of honour and power.

The character of the Grandma stays very traditional. She is absolutely terrified when she meets the wolf on her doorstep.

'Poor Grandmamma was terrified "He's going to eat me up!" She cried'(1). She tries nothing to stop him because she is old and quickly realises the wolf is too powerful for her to overcome. If it were a Grandad answering the door instead you would expect him to at least put up a fight. A man living in a forest may have a shotgun for shooting pheasants so would be able to defend himself with it. He may have worked the land his whole life and consequently he would be fairly strong and muscular, so he could put up a good fight against the wolf. This shows that stereotypically we assume that men are much more muscular and then better physical fighters than women.

The Grandma is described as being, 'small and tough' and her considerable age being shown by her small size (1). The wolf found Grandma difficult to eat because of her age toughened her skin. This contrasts to what the wolf thinks of Little Red Riding Hood by saying 'She's going to taste like caviar,' which is luxurious and expensive (1). Grandma and Little Red Riding Hood are opposites when they are being compared to food because Grandma is described as being small and tough and Little Red Riding hood is soft and delicate. These descriptions are contrasting to their personalities. The Grandma, although she has tough skin, is actually just soft and weak inside, unlike Little Red Riding Hood who is tough and powerful inside despite her youth.

Fairy-tales have been retold many times over the years. There have been many changes and adaptations over this time. The changes in the story line can be seen as a response to the changes in society. It has been suggested that the history of fairy-tales can be seen as a map (3). As in this story and in our society, these assumptions are being challenged due to a new mind set about gender equality. These stories show that you do not have to be stereotypical and can inspire you to behave differently just like Little Red Riding Hood. This can then make changes to your life and impact society around you. As society advances, our views on behaviour, needs and clothing have changed too and authors have updated stories reflecting this. Little Red Riding Hood starts by being a traditional heroine and displaying feminine mannerisms but towards the end she transforms into a more masculine character with her gun and wolf skin coat therefore closing the gender gap.

Feminist literary theory is useful for studying literature; it helps to highlight and expose key aspects in a piece of literary work. It can assist us in increasing our understanding of the work and reasons why the text is structured or worded in a certain way. It can aid and guide us to figure out what was happening socially and historically during the time the work was written. We can also see how society and people's opinions have changed since it was originally published and how people respond then and now. Literary works can always challenge us to do something or look at something differently. Feminist literary theory challenges our views personally and socially as to what a stereotypical man and woman are supposed to be like and if the two genders can ever be equal.

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Social Sciences

Politics – The British Prime Minister in the post-war years

Year 7, Key Stage 3

M. Pusey, Crispin School, Somerset. Supervised by S. Dogo, University of Exeter.

Whether or not one agrees or disagrees with the policies of Attlee's government, which was in power for 6 years, it is undoubtedly one of the most influential governments the UK has been governed by in the 20th century. Attlee's policies were controversial, but his legacy has been claimed proudly by the Labour party and many of his policies remain in place even after several Conservative governments were in power.

By far the most famous of the achievements of Attlee's government is the health care reform that created the National Health Service, providing free health care to all Britons. It was masterminded by Aneurin Bevan, the Minister of Health. He was a Welsh Labour politician, and a left-winger within the Labour Party. Eventually he would resign from his post as the Minister of Labour and lead a group of left-wing Labour MPs.

The National Health Service Act dates to 1946. While it is hugely popular today and Conservative governments have not repealed it due to its popularity, there are disadvantages which in those days were more apparent. It was attacked by the Conservatives when it was proposed. Before the National Health Service was established, free treatment was available from some hospitals, and there was national insurance which was introduced by the Liberal government earlier in the 20th century.

Although the introduction of the National Health Service created more jobs in the health care industry, and life expectancy increased, in addition to the elimination of the embarrassment of not being able to afford a doctor, the plan needed an increase in tax in order to have been able to be funded. Also, people misused and/or overused the service. This was colloquially called the "Dandruff Syndrome", as people went to the doctor for cases that were not medical emergencies. Doctors were overworked and were not granted the freedom they traditionally enjoyed, which caused a lack of incentive for the doctors to work harder now that they had so many more customers. The British Medical Association shared this view and stated that it was against public interest that doctors would be viewed as salaried officers. They have maintained that they were not critical of a public health service, as they have been said to be before.

Another issue facing Britain in the post-war years was the issue of housing. In fact, at that time it was considered the single most important issue facing Britain. Many houses had been destroyed during World War II and little houses were built during the war. In 1945 the number of homes had decreased by 700,000 since the beginning of the war in 1939. 157,000 prefabricated houses were built, although they were disliked by Bevan. By 1948, 750,000 new homes had been built. The two housing acts emphasised quality over quantity. This can be considered both an advantage and a disadvantage. Considering the alarming and urgent situation of housing in Britain in that time period, I consider it a disadvantage as it meant that the target that was set was not met. However, the construction of such a significant number of new houses is very impressive and could be considered a success in general. Again, the main issue at hand was the funding of such huge projects, which

meant increases in tax were needed. It must not be denied that although gains were made, the target was not met and therefore it is a failure. This is especially true as the Conservative government under Churchill that succeeded Attlee's government did achieve these goals, although they were building upon the successes Labour had already achieved and did not have to initiate the new housing projects.

The Education Act was passed by a Conservative called Butler, but Labour was in charge of implementing the reforms that this Act proposed. One of the immediate successes of the Labour government was the instalment of a female Minister of Education over 30 years prior to the election of Margaret Thatcher as the Prime Minister of the United Kingdom. However, the actual achievements of this act are not universally considered to be successful.

35,000 new jobs for teachers were created and almost 1,000 new primary schools were built. This granted opportunities to bright working-class children who might have been destined to have a job that didn't utilise their intelligence to the full potential. This improved social mobility and therefore caused the gaps between different classes to become narrower. The school leaving age was raised to 15, which can be considered a success as it was opposed by the treasury.

The Act provided opportunities for bright working-class children because it recommended a tripartite system of secondary education, encouraging pupils to join technical schools, grammar schools or secondary moderns. Although it succeeded in providing those opportunities, the government failed to implement to the recommended degree the technical schools, which may have meant that there was a lack of skilled workers available for technical jobs in the long run.

One of the main reasons why the implementation of this Education Act is often considered as a success is because there was little money to spend on education. However, this in itself can be counted as a failure, especially considering that taxes were increased and that therefore the government may have failed to assign their budget to the right areas effectively enough.

One of the aspects of the introduction of the Welfare State was the nationalisation of part of the British economy. The Labour Party wanted to keep true to its party constitution and to its working-class roots. The Labour Party Constitution's fourth clause set one of the objectives of the Labour Party to be that workers are sufficiently awarded for their labour, and that therefore the government should control the industry through common ownership. In 1945 it was announced that 20% of the economy would be nationalised.

It seemed much more radical than it was. The nationalised companies were often already partially nationalised, and the nationalisation rarely affected the internal structure of those companies. It also did not create as much controversy as other aspects of the Welfare State, as Conservative governments had also previously nationalised some companies. The only part which created disagreement between the two main political parties was the nationalisation of iron and steel industries. The government set up the National Coal Board as a public corporation to run coal mines. This created a lot of jobs.

While in other times it could have led to huge disagreements, many capitalists were grateful to the government for funding companies which were not doing well at that time. Other nationalised industries were mainly monopolies, and therefore the government was hardly criticised for it.

Although it is arguable that the reforms to the economy changed little, working conditions did in fact improve, especially for miners and farmers. Farmers were given grants to modernise and were guaranteed minimum prices. This allowed output to increase, another success of the government's policy. Another possible success of Labour in this area is its increased appeal to the working class.

Another huge factor that made some people view Attlee's government as a failure is the winter of '46-'47. This winter was extremely cold and there were huge shortages in food and fuel. After a normal December, there was a rapid rise in temperature in January, which caused massive floods, before the temperature started to fall again, causing temperatures of around -20°C. In March, the country was hit by a terrible blizzard. While it is not Attlee's fault that this occurred, the minister of fuel and power, Emmanuel Shinwell, was blamed. He had cut electricity and had rations decreased. Another of the solutions of the government was to import large amounts of "snoek" fish from South Africa. It was disgusting, and the government's campaign was very unpopular. Eventually, snoek was used as cat food. The winter of 1946 is often seen as a turning point, as Labour was starting to lose its popularity. The damage had cost the government millions of pounds which could have been used to develop the welfare state.

In conclusion, I believe that the Labour government was successful in implementing its reforms and these reforms and projects had positive results, even if the initial target had not been met. Labour was unlucky to be in power in a time of economic hardship and cold weather. Also, they managed to implement changes without sufficient financial aid from the USA, which can be considered an achievement. The successes of the welfare state for me far outnumber the failures. It was so popular that the Conservatives did not repeal it when they were in power. Labour had created a new type of politics: the politics of consensus. This allowed Britain to remain stable and preserve the great successes of the Labour government and their Prime Minister Attlee, who is regarded as one of the best prime ministers Britain has had in the 20th century.

PhD Tutor's comment:

Teaching at the Crispin School was a delightful experience for me and the staff and student made it an enjoyable experience with their enthusiasm and appreciation of the programme. M.'s essay shows a high level of understanding and analysis of political issues which we discussed in class and his grasp of the analytical skills required for understanding politics. He is definitely performing excellently and will no doubt do well in any undergraduate course he chooses.

PhD Tutor's comment:

I very much enjoyed working with the pupils at Maltings Academy who engaged enthusiastically with the course (An Introduction to Literary Theory) and produced brilliant final assignments. N.'s essay stood out as an exceptionally well-written, insightful, and confident application of Feminist Literary Theory. His points are creative, original, and well supported with evidence. N. received a 1st for this essay, which means he is already performing to an excellent standard at GCSE level, and I have no doubt he will continue to excel in his future studies.

